

NOTES CONCERNING THE HISTORY  
AND CONTENTS OF THE MUSEUM  
OF COMPARATIVE ZOOLOGY

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Photo. G. Nelson

THE WEST FRONT OF THE PRESENT UNIVERSITY MUSEUM BUILDING. M. C. Z. AT LEFT, GEOLOGY AT RIGHT AND BOTANY IN THE CENTER

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# NOTES CONCERNING THE HISTORY AND CONTENTS OF THE MUSEUM OF COMPARATIVE ZOOLOGY

BY  
MEMBERS OF THE STAFF



1936  
THE TERCENTENNIAL OF THE FOUNDING  
OF HARVARD COLLEGE

MBS



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## INTRODUCTION

BY

THOMAS BARBOUR

I HAVE put together these rambling and disjointed notes for the simple reason that what I have to say does not easily lend itself to a connected narrative. But information concerning the origin of the Museum and the beginnings of teaching and research in the several branches of natural history may, perhaps, be read with interest at the next centennial celebration of the University.

My friend, Professor Samuel Eliot Morison, who has been preparing the official history of Harvard College, for the Tercentenary celebration this year, has provided me with the earliest record concerning the Museum and suggested my examining the early records of Harvard College published by the Colonial Society of Massachusetts (volume 31, 1935). This is a veritable treasury of information.

The first reference which Professor Morison has found is in the account of the visit of Francis Goelet to "The Repositerry of Curiosity." The name Museum was not used at this date, October 25, 1750. Goelet lists a number of curiosities which included "a piece of tanned negro hide, horns and bones, fishes, skins and other objects." This was the sort of material which found its way into most of the early collections.

In 1764 the "Repositerry of Curiosities" burned along with the library, in the fire which consumed Harvard Hall. Shortly after the fire a contemporary poem contained the following stanza:

Why could ye not, the fam'd *Museum* spare,  
Unrival'd in *Columbia*, where my Sons  
Beheld, unveil'd by *WINTHROP*'s artful Hand,  
The Face of Nature, beautiful and fair?

Professor John Winthrop, Hollis Professor of Mathematics and Natural Philosophy, was evidently the first custodian.

By August 1, 1769 the "Musaeum" was assigned a new home, by vote of the President and Fellows, "That the Apartment on the

North side of the entrance to the Philosophy Chamber be a Musaeum for the reception of Curiosities belonging to the College," and later, on March 7, 1771, the Corporation added a new statute, XXIV, to the existing "College Laws and Customs." This was enacted to read as follows:

The Librarian shall be keeper of the Museum & shall have a list of the several articles in it. No person shall go into the Museum without the Librarian or his Substitute unless by the Direction of the President & Tutors, & none but such as are in the Government of the College shall take down any of the Articles out of their places, but when any Stranger desires to take a particular view of any article, the Librarian shall take it down and shew it him. No Candle or Lamp shall be ever used in it. The Committee of the Overseers and Corporation who make a visitation and Inspection of the Library shall on the same day make also a Visitation and Inspection of the Museum to see that the several articles are in their places & in good order, and shall make report of the state of it, at the same time as they do of the Library, that if any article be missing or injured, proper measures may be taken to procure reparation from the person who did the damage.

On February 11, 1772, the Corporation thanked John Hancock for "a curious Corraline on its natural bed," a specimen which I suspect we still have, although the record is far from clear.

On the 20th of May, 1789, the University paid £8 for 80 "crystal bottles with brass tops for the use of the Museum," a drain upon our resources which, starting as this tiny rill, has since increased to a swiftly flowing river.

General George Washington visited the Museum in 1789.

An old diary in the possession of Dr. James Lincoln Huntington and preserved in the old Phelps-Huntington house at Hadley, Massachusetts, described a visit to the College at Hanover, New Hampshire, made by some of Dr. Huntington's forebears in part to see the "curiosities" owned by the College. This journey, which took seven days to accomplish, began on the 20th day of January, 1788, and it is by no means improbable that other of the early New England institutions of learning had cabinets of natural history of considerable importance by about this time.

Our University Museum was, therefore, the first to be founded in North America. The Museum of Charleston, South Carolina, began in 1773, that of Salem in 1799, and the Academy of Natural Sciences of Philadelphia in 1812.

Professor Benjamin Waterhouse showed the Museum to the Venezuelan patriot Miranda in 1784. Miranda, in his diary, reporting the visit, remarks that the collections were ill arranged and somewhat neglected in appearance.

The collections were finally removed from Harvard Hall, and migrated to various storage places for many years. For a while they were kept in Holden Chapel. Later the objects were moved to Boylston Hall, and we read in Dr. O. W. Holmes' memoir of Professor Jeffries Wyman (*Atlantic Monthly*, November, 1874) the following:

We enter the modest edifice known as Boylston Hall, and going up a flight of stairs find a door at the right, through which we pass into a hall extending the whole depth of the building. The tables in the centre of the floor, the cases surrounding the apartment, and the similar cases in the gallery over these, are chiefly devoted to comparative anatomy. Above the first gallery is a second, devoted to the archaeological and ethnological objects which make up the Peabody Museum.

The fine effect of the hall and its arrangements will at once strike the observer. In the centre of the floor stands the huge skeleton of a mastodon found in Warren County, New Jersey, in 1844. Full-sized casts of the "fighting gladiator," as it was formerly called, and the Venus of Milo stand at the two extremities of the hall, and one of the Venus de Medici opposite the door. Stretched out at length in glass cases are the anatomical wax figures, male and female, which used of old to be so wondered over by the awestruck visitors who had gained admission into little Holden Chapel. The skeletons of a large alligator, and of an overgrown ant-eater; a rattlesnake of fearful size and aspect, and a youthful saw-fish, both in alcohol; a slab with fossil foot-prints from the Connecticut River valley, and cases of separate bones from the four animal kingdoms, are the other principal objects grouped about the mastodon.

In the cases around the room are great numbers of fine skeletons, of man and of various animals, — among them of the jaguar, the ostrich, the boa-constrictor, and of immense sea-turtles. Most interesting of all are the skull and other bones of a mighty gorilla. His head and pelvis are far from human in their aspect, but his arm-bone is so like that of his cousin Darwinian, that it looks as if it might have belonged to Goliath of Gath, or Og, king of Bashan. The skeleton of a young chimpanzee, by the side of that of a child, has a strongly marked effect of similar significance. There are also whole series of special preparations to show the parts of the skeleton concerned in locomotion in different classes of animals.

The cases in the gallery contain a vast number of wet and dry preparations, of which a very few may be indicated. One of Professor Wyman's last labors was to refill the jars of the wet preparations with alcohol, and they are

in excellent condition. Among these are many careful dissections of the nervous centres and the organs of sense, and a series of embryological specimens which cannot fail to arrest the most careless observer. There are the Surinam toads with their ova on their backs, like potatoes in their hills; there are the strange fishes with their mouths full of eggs; there is the infant skate with a broad laugh on his face as if he thought it a good joke to have been hatched, and forthwith drowned in proof-spirit, like Clarence in his butt of malmsey. Then come monstrosities of various kind and degree, wonders and nothing more to the vulgar, keys to some of nature's deepest secrets to the man of science. We pass next to the nests of wasps and hornets, and the combs of bees, with casts of the cells, from some of which, it may be mentioned, Professor Wyman took impressions directly upon paper, thus insuring that accuracy for which he was almost unrivalled. The nests of the great ants will next attract the eyes of the curious, and near these, the wonderful carpentry of the beavers, as shown in the sticks they have cut into lengths as if with tools of human workmanship. The great chisels of the rodents, those enamel-faced incisors which are so contrived as to keep their sharp bevel by the mere wear of use, grin in the crania ranged in rows above. And so we might go on through almost innumerable specimens filling the shelves, not with the rubbish of cheap collections, but with objects each of which has an idea behind it, and each important series of which has been illustrated by a paper well known to the scientific world.

Later Professor Louis Agassiz segregated the zoölogical material, and the subsequent history of the zoölogical museum as apart from geology, mineralogy, archaeology and ethnology is told in the chapter next following this one. So much for the beginnings of the Museum.

Benjamin Waterhouse was made Hersey Professor of the Theory and Practice of Physic in 1783, having taken his Doctor's degree at Leyden in 1780. He died in 1812, but as long as he lived he continued to interest himself considerably in mineralogy as well as other topics, but it was not until much later that the collections in geology and mineralogy, and the teaching and research in these fields, became really significant.

This was not by any means true in the biological sciences. Professor William Dandridge Peck (1763-1822), who became Massachusetts Professor of Natural History in 1805, was a versatile genius, unfortunately and rather shamefully forgotten. He was not only an accomplished botanist but was an entomologist of real distinction, and some of his papers on economic entomology, published in the *Proceedings of the American Academy in Boston* as far back as 1796, would be well worthy of publication today in the same *Proceedings*.

were the work which was covered still to be done. Peck travelled abroad, met the great Europeans of the day, and some of his fishes, curiously split and dried like herbarium specimens of plants, are still in existence in the Museum, accurately named, although this was done, in some cases, as early as 1785. Peck's manuscript notes of his lectures are models of clarity and show thoughtful consideration of the topics discussed and a wide range of reading. His remarkable library is now in part preserved in the Boston Society of Natural History's Museum.

The Botanical Garden was started during Peck's term of service (1807), and in 1825, but three years after Peck's death, Nuttall became its distinguished director, a man remembered today by the fact that he published a charming book on New England Ornithology which has been reprinted time and again and is still widely read by many students of birds. There is no evidence to show that the early teaching in natural history was much different from what it was in Europe at that time. It was teaching from textbooks and from lectures, with probably a few objects used in demonstration but carefully guarded from handling by the students. The teaching centered about the spoken and the printed word. It is interesting to note, however, that first-class research began before first-class teaching, and while this brought kudos to the University it did not really extend the influence of the University, inasmuch as few, if any, investigators were produced.

Professor Wheeler describes hereafter the remarkable story of the history of entomology at Harvard, and this fascinating chapter speaks for itself.

I think it is fair to say that the natural sciences had sailed well into the doldrums by the time Asa Gray became Fisher Professor of Natural History in 1842 and until Agassiz was made a Professor in the Lawrence Scientific School in 1847. These two men complemented one another peculiarly: Gray, gentle, reserved, an investigator first and foremost; Agassiz, enthusiastic, fanatical, almost, in his desire to revolutionize the teaching of natural history in this country, and not only to train teachers and investigators, but to carry his advanced methods of teaching from the specimen, and not from the books, into the secondary schools. Louis Agassiz trained a host of men who became the principal naturalists of the next generation.

All now have passed away, but many great names remain: Verrill went to Yale; Packard to Brown; Edward S. Morse to Japan and then to Salem; David Starr Jordan to Indiana and then to Leland Stanford, first as Professor and then as President; B. G. Wilder to Cornell; J. A. Allen to the American Museum in New York; and many other names could be added to this list. While Agassiz travelled about the country lecturing and collecting for the Museum and acting part time as Professor in Charleston, South Carolina (where he is said to have been better paid than in Cambridge), Gray began building up the great herbarium which today bears his name. With the opening up of the West, Government expeditions made great botanical collections. These were sent to Gray for study. He it was who first pointed out the relations of our Eastern flora to that of temperate China and who first thought out the explanation of this phenomenon. All this time he was carrying on his correspondence with Darwin, and Darwin, in an unpublished letter, speaks of him as a most sympathetic and valued critic. Gray championed evolution during those difficult days when many stood on the other side while Agassiz could not quite see eye to eye with Gray in this matter.

But the pictures of Darwin and Huxley hang on the wall of the Director's Room in the Museum to this day alongside those of Agassiz's old friend and patron, Humboldt, of his admirer Owen, and many other equally distinguished European contemporaries.

Agassiz began his investigations in Europe and continued to draw not only inspiration but prodigious masses of material which laid the foundations for the great collections in natural history which enrich our Museum today, making it the most evenly developed and, in many departments, the richest of any University Museum and unquestionably in a class with the great governmental museums of the Old World. The resources of the Museum in its several departments are set forth in pages that follow these. The story of the acquisition of the many components which go to make up our Museum at the present time is a very absorbing one.

Jeffries Wyman became Hersey Professor of Anatomy in 1847, after his name had become widely known because of his brilliant and versatile contributions to anatomy, comparative anatomy and zoölogy. He first described the gorilla and later curious creatures procured during his trips to South America with his friend George

Augustus Peabody. Wyman was a shy, retiring man of frailest health for years. But while he was writing brilliantly and with extraordinary patience and accuracy on many topics he was aiding in bringing together the collection which formed the Peabody Museum of Archaeology and Ethnology. When the endowment for the beginning of this institution came in 1866 he became curator of the Museum, and held the position until his death in 1874, less than a year after the death of Agassiz.

F. W. Putnam, another of Agassiz's students, took charge of the Peabody Museum the year after Wyman's death and continued as Peabody Professor and Curator until 1913, when he became Emeritus; he died two years later. Putnam got a passion for accumulating material straight from Agassiz. He realized that primitive man was disappearing all over the world, and where he was not disappearing he was ceasing to make and to do the things which his forefathers had done. Putnam was by no means a collector alone. His students went far and wide over the country to become curators of new museums and to teach archaeology from coast to coast. His students in the Peabody Museum today continue to enlarge its collections and to train teachers and investigators, and this department holds an almost unique record among all the departments of the University for the extraordinary proportion of anthropological positions held throughout the country by Harvard men. The Peabody publications have gone far and wide describing the discoveries made in the Museum and in the field by men from this section of the University Museum.

The Mineralogical and Geological Museums, also sections of the University Museum, grew under J. P. Cooke and later with the aid from Wolff, Sayles, Holden and other friends of the department. N. S. Shaler, who died in 1906, continued to the last to fill Sanders Theatre with a throng of young men who came to hear him first out of curiosity, and who remained to be enthralled with the manner in which he depicted the great events of geological history.

It is not my desire here to discuss the work of living men, nor am I qualified to do so, and as Geology at Harvard is at the peak of its most effective period of both teaching and research at the present time there seems to be little more to do than to state this fact and to rejoice to be able so to do.

The science of Palaeontology has had its ups and downs. The invertebrate field has been extraordinarily well represented and the invertebrate collections have been used both for instruction and research most effectively. These collections are vast and derived from all parts of the world.

After Louis Agassiz's death his son Alexander took charge of the Museum of Comparative Zoölogy as Curator, as the head of the Institution was then called. Later he became Director of the University Museum, of which the Museum of Comparative Zoölogy, now better known as the Agassiz Museum, is also a part. He disliked teaching as much as his father enjoyed it. He closed the Museum to all but advanced research workers, and the Museum came to be less and less known in America, though more and more famous abroad. Alexander Agassiz, who was as shy and retiring as his father had been genial and expansive, was, nevertheless, a person of extraordinary charm of manner and tenderness of heart. Concerning this I speak at first hand. His unrivalled knowledge of marine life acquired during the seaside studies made in his early years, supplemented by extensive reading, led him for many years to collect assiduously in New England and to undertake zoölogical exploration abroad. The results he frequently worked up himself.

These results make up his great classical contributions to science. During his later years he explored widely and made great collections which were distributed to specialists while he himself, turning aside from general zoölogy, began to accumulate data and observations concerning the coral reefs. These studies have provided information in the form of charts and photographs of importance to geologists and others interested in the coral reef problem. Unfortunately, Mr. Agassiz did not write any general conclusions as the result of the years which he devoted to his survey of coral reefs, to the exclusion of those zoölogical investigations which, by training and early experience, he was better fitted to pursue. Nevertheless his reports afford some general ideas of what he thought upon the subject. To his death he kept up his interest in the Echini and was the authority concerning this group.

To keep his section of the University Museum progressing he was forced to spend a large part of his time securing the wherewithal so to do. The romantic story of his development of the Calumet mine

needs no telling here. He saw clearly the importance of organizing expeditions to keep the Museum growing and sent out many field parties and later went on long trips himself. Thus Garman went to the Bad Lands of the West, in the Indian days, and brought back the collections of vertebrate fossils later described by Scott and Osborn. Alexander's father had already raised the money to buy the great Lesquereau collection of fossil plants which still remains the most important in America. After a while Charles Eastman came to be Vertebrate Palaeontologist in the Museum, but he never taught and was in time called elsewhere. Still, the collections have continued to grow, and Harvard now has its own fossil fields in Wyoming where students work every summer and whence they bring back many beautiful and significant specimens.

Alexander Agassiz during his younger years was probably the foremost Marine Zoölogist in the world. He continued through life his interest in the Echinoderms. As I have said, he was a sensitive, shy, retiring man, impatient of crowds and of publicity, at times almost violently so. It would not be fair, however, to say that he was not essentially a teacher as well as an investigator, though in an entirely different way from his father. During all of his later years he took several young men upon his deep sea expeditions or while he was studying coral reefs, who have become distinguished teachers and investigators today and who still recall with a thrill their recollections of seeing Agassiz brought on deck on a mattress, limp from seasickness, to spot, with uncanny accuracy, the specimens as they came from the deep sea dredge, setting aside one by one the creatures which were well known from those which were new and worthy of special study, and which should be turned over to the artists of the expedition. The life of Alexander Agassiz has been as well told by his son George as was his father's life history told by Mrs. Louis Agassiz.

It has been a great pleasure to receive, from the hand of my friend, Mr. George Russell Agassiz, Alexander's eldest son, the introductory chapter which follows this disjointed little historical preface and which gives an account of the organization and development of the Museum of Comparative Zoölogy as a distinct scientific institution apart from the other "cabinets of natural history."

Circumstances which are difficult to understand clearly at this late

date brought about an unfortunate separation between the Museum and its staff and the zoölogical laboratory, also housed in the Museum building with its own distinguished group of teachers who trained men in the modern technique of zoölogical research just coming out of Germany. The rise of new aspects of Zoölogy such as Cytology, Spermatogenesis and Organogenesis, the phenomena of regeneration, and other topics fashionable, so to speak, at the time, involved the use of the microtome and the microscope, and for one reason or another a real schism arose, between those who studied the animal as a whole and those who observed its parts. This was perhaps natural enough, but the cleavage of interests became far too wide and too deep. It must be remembered, moreover, that these were the years when few, if any, foresaw the interdigitation of the sciences as we see it today. Botany was either cryptogamic botany, headed at Harvard by the great names of Farlow and Thaxter, or it was systematic botany up at the Gray Herbarium, or it was physiological botany at Dr. Goodale's laboratory in the Botanical Museum, or it was dendrology, with a great leader, Charles Sargent, at the Arnold Arboretum. No one would have dreamt twenty years ago that there was no way of really subdividing botany in any fundamental way. The fact that all living creatures are subject to the same natural laws and that they react to them in essentially similar ways, and that the boundaries between the natural sciences really break down, and that now without discussion or rancor it is universally agreed that the curators in the museums teach if they want to, would have been unthinkable a few years ago. Thus many hold positions in the Faculty of Arts and Sciences, and the Professors from the laboratory draw freely upon the museums for material of all sorts, even to be cut up and destroyed; physiology finds a place in this company and indeed leads the biological sciences into contact with the sciences of chemistry and physics. Palaeontology is geology on one side and historical zoölogy on the other. Anthropology is sociology on one side and applied zoölogy on the other. So it goes.

The laboratories to teach the natural sciences are now housed and endowed as never before. Everyone is sincerely respectful of the interests of all colleagues, hatchets are buried. We try to turn out only the very best men, trained to maintain the standards which Professor E. L. Mark and Professor George H. Parker maintained during their

years as Directors of the Zoölogical Laboratory. When a young man finished his training under these men a position was assured, and the number of graduates who are among the leaders in teaching and research throughout the United States today is probably somewhere in the vicinity of three hundred. Methods of research have changed and the topics which most excited men have varied from year to year like Paris fashions. At times the emphasis has been on a study which like a sponge may soon be wrung dry; at others wide doors into deep caves of learning have been opened where exploration still continues. I believe this is inevitable.

Wendell Holmes once said, that life is painting a picture, not doing a sum, and many artists looking from the same window would each paint a different picture of what each one saw. So it is with our sciences. We each paint the picture as we see it and like all else in life our pictures are not equally good. I believe, however, it is fair to say that the Harvard gallery would at least have on its walls pictures more diversified and as likely to endure as those painted through the last hundred years by the teachers and students of any other institution.

## THE HISTORY OF THE M. C. Z.

BY

GEORGE RUSSELL AGASSIZ

*Chairman of the Visiting Committee and Member of the Faculty*

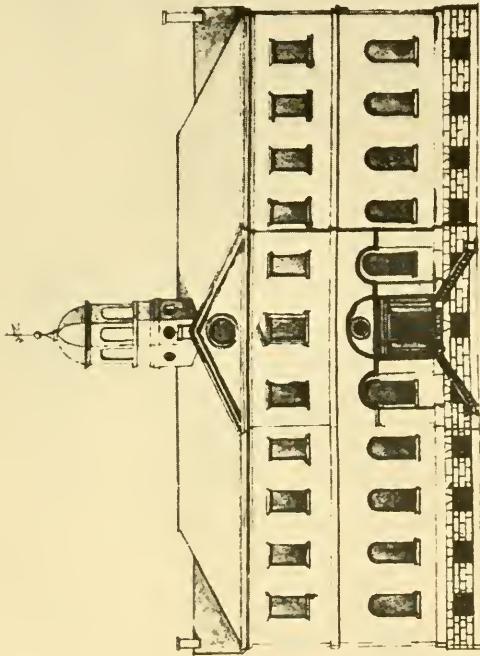
THE Museum of Comparative Zoölogy originated in the specimens already owned by the University and those that Louis Agassiz stored when he came to this country in 1847, in a little shanty built on piles on the banks of the Charles River, close to the bridge that now leads to the Harvard Stadium. In 1850 the collections had outgrown this primitive shelter and were removed to a wooden building where the old gymnasium now stands. By 1852 the care of the collection had grown to be more than the very modest means of the Professor could meet, and a fund of twelve thousand dollars was raised by private subscription to purchase his share of it for the College. The expense of its charge, however, still remained in his hands, and he devoted untiring enthusiasm to increasing and maintaining the specimens.

In 1858 the Corporation of Harvard College made a small allowance for the care of the collections, and during the same year a fund of fifty thousand dollars, left by Mr. Francis C. Gray, was placed at the disposal of Louis Agassiz for the purchase of specimens, under the condition that the institution so aided should be called "The Museum of Comparative Zoölogy." Thus it happens that this Museum is saddled with a cumbersome and inappropriate name. Accustomed to the European method of seeking government aid, Agassiz went to the State Legislature, and to everyone's amazement, extracted one hundred thousand dollars from those hard-headed New Englanders, while at the same time a further fund of seventy-one thousand dollars was raised by private subscription. With these resources he built what was then intended to be, and now is, the East portion of the North wing of the University Museum. This first bit of the building consisted of four rooms on a floor, was five stories high, and was completed in 1860. Thus was housed the first of the large University Museums in the New World. Many of the early

SOUTH FRONT of HARVARD HALL AT CAMBRIDGE in NEW ENGLAND

*Original plan of the original South Front of Harvard Hall  
on the occasion of the delivery of the first annual  
lectureship of the Society in memory of Jonathan*

“THE APARTMENT ON THE NORTH SIDE OF THE ENTRANCE SHALL BE A MUSEUM” 1769





assistants were later placed in charge of museums, which were afterwards established all over the country. Most of the prominent naturalists of that generation were men who had worked under Louis Agassiz.

The Museum was not originally directly under the control of the University, which gave the land. It was administered from its own funds, and under the direction of a Board of Trustees, representing the Commonwealth and the University. Further grants from the legislature and private subscriptions, as well as the results of his own expeditions, and material gathered by exchange, enabled Louis Agassiz rapidly to build up the Museum collections. He made special efforts to maintain the growth of the Museum during the war of the Rebellion, "that when our troubles are over it may appear that even civil wars cannot cripple the onward progress of science in the New World." Indeed Louis Agassiz pushed the development with such zest as to seriously cripple his own slender means. To put the family fortunes on its feet, Mrs. Agassiz organized a girls' school, famous in its day, where among other teachers were Louis Agassiz and two of his children.

By 1867 the first portion of the wing, begun in 1859, was inadequate for the accumulating mass of material that poured in from all sides. The lecture rooms were invaded, until it was almost impossible to move about in them. In 1868 the collection of fishes had already become one of the first in the world, and the marine invertebrates were probably without a rival among other museums. Oceanography has always been one of the chief interests of the Museum since Louis Agassiz's early days in the United States, when he explored the waters of Florida in the "Bibb," under the auspices of the Coast Survey.

Louis Agassiz's most important expedition was to Brazil in 1865-66, financed by Nathaniel Thayer. Dom Pedro II, a patron of science, welcomed the expedition when it arrived in Brazil. Its members were guests of the nation. Steamers were placed at their disposal to take them up the Amazon. The Governors of the various states supplied men, means, and material to assist them in every possible way. The collections sent back form some of the most important of the Museum; especially that of the fishes from the Amazon and its tributaries.

By the beginning of the eighteen-seventies failing health affected Agassiz's usual activities. In 1871-72 he made a voyage on the Coast Survey steamer "Hassler" to California, hoping to come home with renewed vigor and supervise the rearrangement of the Museum collections in the new part of the wing, then under construction. Defects in the apparatus limited the results of the expedition. Nevertheless, Agassiz on his return wrote to one of his assistants in Europe — "The collections made during the Hassler Expedition are simply splendid. We have brought home 265 barrels, or boxes of specimens; averaging nearly one per day of our working time."

The death of Agassiz in 1873 found four-fifths of the wing of the Museum completed. It was crowded beyond belief, and had an income of only \$10,000. The future of the institution did not seem bright; it looked as if it might share the fate of so many great undertakings and perish with its founder. But his son Alexander Agassiz, to whom the management fell, thought otherwise. The latter was not only a man of science, but also, unlike his father, an unusually able executive and successful mining man. Through filial affection he put his shoulder to the wheel to preserve the Museum, and for the rest of his life devoted much of his energies, and a good slice of his fortune, towards its development. He collected an endowment fund, to which he subscribed liberally, besides from year to year making good any deficiency in the running expenses.

In 1876 it was found advisable to discontinue the joint control of the Commonwealth and the College in the affairs of the Museum. By legislative act it was turned over to the University and its management rested in a Faculty of five, including the President of the College and the Director of the Museum.

Alexander Agassiz completed the Museum of Comparative Zoölogy as it now stands. In 1877 he built the remainder of the North wing; in 1883-84, the Northwest corner-piece; and in 1890-91 a further continuation of the façade.

He made nearly a score of oceanographic expeditions to many distant seas, and brought back vast quantities of material which greatly enriched the Museum collections. Among the most important of these explorations were: three cruises of the "Blake," 1877-80, in the Atlantic and Caribbean; three cruises of the "Albatross," 1891, 1899-1900, 1904-05, covering vast regions of the Pacific; an ex-

ploration of the Great Barrier Reef of Australia in the steamship "Croyden" in 1896; and an expedition to the Maldivian Islands in the Indian Ocean in the "Amra," 1901-02.

In 1898 Agassiz resigned the directorship of the Museum, but retained his quarters there, giving it his financial support, and continuing to enrich it with the results of his scientific expeditions.

After his resignation, the Museum was managed for a short time by Dr. W. McM. Woodworth, one of the younger Agassiz's assistants in various of his expeditions. Dr. Woodworth was succeeded by Mr. Samuel Henshaw, who had been on the staff of the Museum since 1892. After Alexander Agassiz's death in 1910, without the stimulus of his interest or his financial support, the management of the Museum became a trying and discouraging matter. But Henshaw with a whole-hearted and unwavering enthusiasm, and an almost unparalleled devotion, gave his entire existence to furthering the welfare of the Museum, to upholding its traditions and maintaining the high level of its scientific output. This he was the better able to do from his wide range of accurate knowledge, an invaluable asset in editing the reports of the specialists on the collections of Alexander Agassiz's expeditions, which were still coming in to swell the Museum publications. These, from its earliest history, have given the institution a distinguished international position among its peers, and include today 73 octavo and 53 quarto volumes, which are in quality and quantity fully equal to the publications of scientific societies of the first rank. On the completion of his thirty-fifth year as a member of the staff, Henshaw resigned his directorship on November 1, 1927. He was succeeded by Dr. Thomas Barbour, who has been connected with the Museum ever since his graduation from Harvard.

Since Dr. Barbour's appointment, the Museum has been enriched, not only by collections made on expeditions of his own, to the East and West Indies, and many portions of Central and South America, but also from numerous expeditions of the staff, and by purchase, and exchange. The Museum collections are now, without exaggeration, of inestimable value.

As the study collections and opportunities for exploration and research are the chief desiderata of a university museum, it was decided to curtail the space devoted to the exhibitions open to the pub-

lic. The standard exhibition rooms were originally furnished with a gallery; these have been floored over, creating virtually a new story for the research department, so that, with the removal of most of the student laboratories to the Biological Institute, now built on the other side of Divinity Avenue, ample provision has now been made for expansion for a number of years. The rearrangement of the exhibition rooms, now seen by the public, represents a great amount of thought, work, and the devotion of all the staff at the cost of unselfish sacrifice of much of their own scientific work.

In the days of the elder Agassiz, he and his assistants, in addition to their museum work, gave a certain amount of instruction to graduates, undergraduates, and special students. The younger Agassiz disliked to teach, and never did so, except for the occasional supervision of the work of a few advanced students. Under his régime the teaching of Zoölogy was made a separate department under the control of the Faculty of Arts and Sciences. But it continued to have its headquarters at the Museum, where it made use of the collections, laboratories, and lecture rooms. Recently, in order to facilitate the training of young men to be Museum Curators and to enable them to obtain advanced degrees, several of the Curators have received appointments as Members of the Faculty of Arts and Sciences, and instruct, at their pleasure, a few mature students.

In conclusion, a few words from an address delivered by Alexander Agassiz on the completion of the University Museum in 1902, will best indicate the purposes of the Museum of Comparative Zoölogy:

“About one-sixth of the floor space is devoted to exhibition purposes. It is not simply an agglomeration of room after room, of case after case, filled with specimens which to the uninitiated mean nothing; but it is a Museum which has been intelligently arranged. Each room means something; each room is there for a purpose, each case is there for a purpose, and each specimen should be there for some reason.

“But what is shown to the public is by far the smallest part of the Museum. Above and below the exhibition floor are many stories and a basement in which are stored, as it were, the archives of the Museum, to say nothing of the library, the lecture rooms and laboratories, which are used by the professors and their assistants, who contribute so great a share in the development of the Museum. In these

other rooms are stored collections which have been made during the explorations and expeditions of the professors and their assistants (as well as in other ways); collections without which it is impossible for a teacher or professor in natural history to exist. All questions, for instance, which relate to geographical distribution on land and sea, to variations, to systematic zoölogy, and to the history of the human race, can only be solved by immense collections, carefully made, and which can be studied with ample room. Those are the conditions which a university must aim to give to its professors.

“It is of the greatest importance that a university museum should not attempt to do what larger museums can do with impunity. Our object is not to make vast collections, simply for the sake of having vast collections. Our object should be to make collections in such a way that they may be used to illustrate certain points, or used to carry on certain lines of investigation. That is really the function of a university museum.”

# ENTOMOLOGY AT HARVARD UNIVERSITY

BY

WILLIAM MORTON WHEELER

ENTOMOLOGY is, of course, only one of a number of branches of zoölogy, which in turn was originally a branch of a larger and more vaguely defined department of human knowledge known as "natural history." As early as the latter part of the eighteenth century, entomology had acquired the status of an independent science. This was due, no doubt, to the extraordinary number, variety and beauty of the objects with which it dealt and the ease with which large collections of them could be made, perfectly preserved and compactly stored. By the beginning of the nineteenth century the museum and even the taxonomic technique of the entomologist were nearly as highly developed as at the present time. For this development we are largely indebted to such great pioneer amateurs as Linnaeus, Degeer, Latreille and Fabricius. Although Réaumur and his immediate successors emphasized the important bearing of the study of insects on human welfare, applied entomology, as a serious branch of the science, has proved to be a much more recent development. Hence even in Europe entomology was very slow in acquiring recognition as a fit subject for instruction and research in schools and universities. This statement, however, does not apply to Harvard University, because it has had a nearly continuous tradition of teaching and research in the science and, interestingly enough, even in applied entomology, since the end of the eighteenth century. Indeed, since 1795 there has probably been in some department of the University at least one competent entomologist to whom the interested student could turn for encouragement and guidance, and these teachers were not merely competent, but several of them attained lasting fame not only as contributors to entomological science but also as unusually inspiring personalities. The fact that few of them delivered or cared to deliver formal courses of lectures had its advantages, for it enabled them to enter into more intimate and more helpful relations to their

students. Most of these teachers evidently resembled Mark Hopkins in their preference for very small classes, but instead of sitting on a log and exchanging abstractions with a student, they preferred setting to work with him and investigating the insect fauna of the log.<sup>1</sup>

The growth and differentiation of entomological science at Harvard, during more than a century, naturally led to the pursuit of the

<sup>1</sup> Some of those who have recently attempted to write the history of entomology in the United States seem to have been led astray by a failure to appreciate the pedagogical importance of such companionate research. Professor Escherich, to mention only one example, in his history of applied entomology in the United States ("Die angewandte Entomologie in den Vereinigten Staaten," 1913, p. 68 *nota*), after remarking that "the first professor of Entomology at an American University was our countryman Dr. H. A. Hagen," quotes the following passage from a paper by the late Professor J. H. Comstock ("The Present Methods of Teaching Entomology," *Journ. Econ. Entom.*, 4, 1911, pp. 53-67): "Although Dr. Hagen came to the Museum of Comparative Zoölogy in 1870, his first course of lectures was given in the summer of 1873, and his class consisted of a single student, the writer of this paper. That was a course of lectures never to be forgotten by the one who heard it. It was a very hot summer, and Dr. Hagen suffered with the heat. About nine o'clock each morning he would come into the laboratory, say a cheery good morning, take off his coat and hang it back of the door, take off his vest and put it with his coat, take a seat by a small table, light a German pipe with a very long flexible stem, place the bowl of the pipe on the floor behind him, take a few puffs, and then say, 'Come and I will tell you some dings what I know.' The student would then take a seat on the opposite side of the table, and the professor, with sheets of paper before him, which served the purpose of a blackboard, would take up the subject where it had been dropped the previous morning." Since Comstock later became a great teacher of entomology at Cornell and trained many entomologists, including Dr. L. O. Howard, for many years the head of our Federal Bureau of Entomology, the casual reader might infer from Escherich's remarks that Hagen's German influence on entomology and especially on economic entomology in America was profound. But those of us who knew Professor Comstock intimately are acquainted with another of his anecdotes which proves that before he went to Cornell and later to Harvard he had been inspired to take up the study of insects by reading Thaddeus Harris' famous work on "Some Insects Injurious to Vegetation," first published in 1841 and after various editions issued in its final form in 1862, with beautiful wood-cuts and colored steel-engravings executed under the supervision of Louis Agassiz. Now Harris, while acting as librarian of Harvard College, is known to have given a private course in entomology as early as 1837 to 1842, and had been a student of William Peck, our first native born American entomologist and first professor of natural history at Harvard (from 1805 to 1822: *vide infra*). To regard Hagen, therefore, as the first professor of entomology in the United States means merely that even by the middle of the nineteenth century the science had become so vast and intricate as to require all an investigator's time and energies. Previously, as above stated, entomology had been a branch of natural history, but this does not imply that the subject had not been taught at Harvard.

subject in more than one department. The actual teaching was eventually carried on in Cambridge in connection with the other biological sciences, the research connected with its applications to agronomy and forestry was assigned to the Bussey Institution at Forest Hills, its applications to tropical medicine and comparative pathology to the Harvard Medical School and its taxonomic study to the Museum of Comparative Zoölogy. Since large collections of carefully identified insects are absolutely essential to the development of study and research in all fields of entomology, this Museum, since its building by Louis Agassiz in 1859, and the Museum of the Boston Society of Natural History, since its foundation in 1831, have been necessarily the permanent centers about which the activities of all the academic and non-academic entomologists of Boston and its vicinity have revolved in closer or more remote orbits.

That there was some interest among the early colonists in the natural history of insects as early as the seventeenth century is shown by a portion of a letter from Benjamin Bullivant, of Boston, recording some casual observations on fireflies, butterfly pupae and grasshoppers, addressed to James Pitiver of the Royal Society of London, and published in the *Transactions of the Society* for 1698. The scientific study of insects at Harvard, however, begins with William Dandridge Peck (1763–1822), who, born in Boston as the son of a noted naval architect, graduated from the Institution in 1782 and became its first Professor of Natural History in 1805. It is said that he became interested in natural history by reading a copy of Linnaeus' "*Systema Naturae*," cast up by a ship wrecked near his home at Kittery Point, Maine.<sup>1</sup> As early as 1794 he published the first systematic paper on zoölogy in America, a description of four remarkable fishes taken near Piscataqua in New Hampshire. Soon afterwards he became much interested in economic entomology and, between 1795 and 1819, published at least seven excellent studies of some of our common insect pests, including the canker-worm, slug-worm, pine-weevil, locust-borer, etc. The tradition in economic entomology, however, was continued by one of Peck's students, Thaddeus Harris (1795–1856). He was born in Dorchester, Massachusetts, and graduated in 1815. Although he became a practising physician, he gave up his practice in 1831, when he was appointed Librarian of Harvard

<sup>1</sup> E. O. Essig, "A History of Entomology," 1931, p. 730.

College, a position which he retained during the remainder of his life. While thus engaged, he gave a private course or what we should now call a "seminar" in entomology, at which attendance was voluntary.<sup>1</sup> Like Peck he was greatly interested in the applied aspects of entomology, and published a long series of important papers on insect pests. This work culminated in his classical "Treatise of Some of the Insects Injurious to Vegetation," to which I have referred. Though Dr. L. O. Howard, in his very entertaining "History of Applied Entomology," *Smithsonian Miscellaneous Collections*, 1930, gives the impression of having no great enthusiasm for Harvard entomologists, he could not refrain from paying the following tribute to Thaddeus Harris: "Harris was a learned scholar, a man of good birth and sound breeding, a lover of nature, and one of the best examples of a high type that New England produced a hundred years or more ago. Quite the most beautiful appreciation of his character and of his work that has been published was done by A. R. Grote in his paper entitled 'The Rise of Practical Entomology in America,' published in the Twentieth Annual Report of the Entomological Society of Ontario in 1899. It is so beautiful a bit of writing that it deserves a place in literature, and it is so high an appreciation of Harris that it should be read by every entomologist. The Memoir of Harris, by Colonel Thomas Wentworth Higginson, which prefaces Scudder's 'Entomological Correspondence of Thaddeus William Harris, M.D.,' should be read in connection with Grote's charming paper. No one who reads these two papers will ever think of Harris except with admiration, deep respect, and affection.

"From Colonel Higginson's account it appears that, while per-

<sup>1</sup> According to Dow ("The Work and Times of Dr. Harris," *Bull. Brooklyn Entom. Soc.*, VIII, 1913, p. 108). "For five years from 1837 Dr. Harris filled a vacancy in the Chair of Natural History, giving a course of lectures twice a week to the senior class. Not satisfied with this, he organized an evening class for voluntary attendance, which was, in fact, something like the Entomological Societies of today, with one speaker having the floor most of the time. John W. Randall, a senior from Maine, attended these meetings. He turned to beetles, which were also Harris' favorites, and collected near Cambridge during the academic season and in Maine during vacation. Two papers were the result of his efforts, in which 87 new species were described. Randall became a physician but never reappeared as a coleopterist. Years later his papers were edited by P. S. Sprague and E. P. Austin, who reidentified the species, of which 47 are saved from synonymy."

forming the Librarian's duties at Cambridge, Harris formed a private class in entomology which met on one evening in every week; and it appears also that he had apparently expected and hoped to be made full professor of natural history in the College. These hopes, however, were not fulfilled, and Dr. Asa Gray was chosen for the post in 1842. Of course, Gray's claims were very high, and it was necessary, apparently, to appoint a botanist of the highest attainments who should have charge of the botanical garden. Harris' disappointment was never voiced, and he continued his work in his quiet, efficient way, all the time contributing articles on entomology and horticulture to scientific and agricultural journals. He was an excellent botanist and this fact helped to make his entomological work broader and sounder. American entomologists of today may well think with pride of the man who was really the founder of applied entomology in this country."

Soon after coming to Cambridge in 1847, Louis Agassiz began to amass a collection of zoölogical, palaeontological and other specimens, which were added to those already possessed by the University and later moved to the Museum of Comparative Zoölogy as soon as a portion of its building had been completed in 1859. His interest in all fields of zoölogy was so intense and well-balanced that collections of insects were not neglected, and his solicitude for the care and study of these collections was shown in his wise selection of curators and their assistants in this department of the Museum.

During 1862 Samuel Scudder (1837-1911) had charge of the insect collections. He was assistant to Agassiz and custodian of the Boston Society of Natural History until 1870 and Assistant Librarian of Harvard College, 1879-82. Besides aiding in founding the Cambridge Entomological Society in 1874 and publishing the journal "*Psyche*," two ventures which have survived to the present time and have aided greatly in the coöperation of the entomologists in New England, Scudder, in his researches, covered a wide field and greatly increased our knowledge of entomology. His work on the Orthoptera and butterflies of North America is still of great value. As palaeontologist of the United States Geological Survey, 1886-92, he laid the foundations of the study of insect palaeontology in our country. He described more than one thousand species of fossil insects and published a catalogue of the known fossil species of the world. His

extraordinary industry is attested by the fact that his bibliography runs to nearly eight hundred scientific papers. That even his work as Assistant Librarian yielded a rich harvest is shown by his "Nomenclator Zoölogicus," published in 1882 and containing a catalogue of all the generic names employed by zoölogists up to that time.<sup>1</sup>

Though undoubtedly the most learned entomologist of his generation, Scudder was far more. As Mayor says, "few men of science have endeared themselves to those around them as did he, endowed as he was with an innate quality of kindness that, seemingly unknown to him, graced his every word and act. One recalls his tall, handsome form and the strong, interesting features so wonderfully relieved by the happy soul that seemed ever ready to burst forth in a bright flash of interest over any and all things of that manifold nature to the observation of which his life had been devoted."

Two other eminent entomologists followed Scudder as curators of entomology. Alpheus Spring Packard (1839-1905) was engaged to look after the collections in 1864 and Phillip Reese Uhler (1835-1913) from 1864 to 1867. Both men made notable contributions to our knowledge of American insects and the former especially was interested in every aspect of insect life. At Brown University Packard was later professor of entomology and zoölogy, while Uhler became America's leading authority on the Hemiptera and Homoptera, while acting as librarian and later as provost of the Peabody Institute of Baltimore.

Hermann August Hagen (1817-93), curator in the Museum of Comparative Zoölogy from 1867 and also professor of entomology from 1870-90, was born in Königsberg, East Prussia. After graduating from the gymnasium, he studied medicine at the university of his native city, where both his father and grandfather had been professors. He was fortunate in having three remarkable teachers, Von Baer, Rathke and Von Siebold. His thesis, presented for the degree of Doctor of Medicine (1840), was on the synonymy of the European dragon flies. It is said that his attention had been attracted to the Odonata "because by chance the first specimen he caught proved to be an unidentified insect of that order."<sup>2</sup> After studying till 1843 at

<sup>1</sup> The motto of this work was taken from Pope's "Dunciad":

" . . . index-learning turns no student pale,  
Yet holds the eel of science by the tail."

<sup>2</sup> S. Henshaw, "Hermann August Hagen," Proc. Amer. Acad. Arts Sci., 19, 1904, pp. 419-423, portrait.

the universities of Berlin, Vienna and Paris, Hagen settled in Königsberg as a practising physician and surgeon. This did not prevent him from diligently pursuing his entomological studies, at first on the dragon flies and later on the Neuroptera, at that time a heterogeneous complex embracing also our modern orders Corrodentia, Plecoptera, Mecoptera and Trichoptera, and the fossil insects of the Baltic Amber. During 1855 to 1860 he published a masterly monograph on Termites, in 1861 his well-known "Synopsis of North American Neuroptera," which was prepared at the special request of the Smithsonian Institution, and in 1862 and 1863 his "Bibliotheca Entomologica" (2 volumes). Owing to its completeness and great accuracy, this monumental work, which contains a bibliography of all the entomological literature from the earliest times, is one of the most useful in the entomologist's library.

After settling in Cambridge, Hagen devoted his energies to building up and caring for the Museum collections and in teaching. Mr. Samuel Henshaw, who was one of his most intimate friends, gives us the following account of these activities: "Dr. Hagen entered upon his duties at the Museum with great zeal; and his detailed plan for the arrangement of the collections, though somewhat modified, is, and is likely to remain, the basis for the future. Deeply interested in everything relating to museum work, as his appreciation of series of specimens, his care for their preservation and for the accuracy of their localities, and many minor details, clearly indicate, it is in this collection as well as in his writings that his contributions to science are to be found. Here alone we can fully realize the extent of his discoveries, the keenness of his insight, his skill at preparation and dissection and with the pencil. His devotion to the Museum knew no bounds; all personal interests were secondary. In 1876 he refused a most flattering and urgent invitation to take charge of the great entomological collections of the Königliches Museum für Naturkunde in Berlin, and the time that might have been given to original work was lavished upon the care and arrangement of the collections which grew rapidly both in size and value. The biological collection, or that illustrating the life history of the species, is a prominent specialty of the Cambridge Museum. In this are preserved specimens showing every condition of an insect's life, the eggs, larvae in all stages from those just hatched to those full grown, their burrows,

nests, partially devoured leaves, etc., the work of both larvae and adults, the frass or excrements often of great importance, pupal stages, adults of both sexes, and the parasitic and predaceous enemies also in all stages of development. Dr. Hagen's influence upon the formation of such biological collections has been very great; few were in existence at the time when, almost unaided, he created that at Cambridge, and the care and elaborateness with which the whole is labelled makes it not only a worthy model, but most truly a monument to persistent and well directed industry. His lectures, given at rare intervals to advanced students, contained much genuine and exact knowledge, and his many acts of kindness and words of wise counsel will not soon be forgotten by those who enjoyed the facilities of the department under his charge."<sup>1</sup>

Among Hagen's assistants and preparators, three are worthy of mention, because they either gave him valuable aid in his curatorial labors or actively increased the collections: Jacob Boll (1828-80), a well-known Swiss naturalist, made important collections of insects and other animals in the Southwest and worked at the Museum, 1871-72;<sup>2</sup> George Robert Crotch (1842-74), a British student of the Coleoptera and author of a very useful list of North American species of the order published in 1873; and Eugene Amandus Schwarz (1844-1928), a German who devoted his long life to the study of the North American Coleoptera. From 1878 to the time of his death, Dr. Schwarz was one of the most competent and genial entomologists of the United States Bureau of Entomology. In this connection, mention should also be made of Baron Osten-Sacken, who, though an independent diplomat and savant, spent two winters (1873-75) incorporating his own extensive collection of Diptera and that of Loew with the previously existing collections of these insects in the Museum.

<sup>1</sup> Some of Hagen's wise counsel was rather humorous. Thus he advised Professor E. L. Mark, who as a young instructor in 1877 was giving a course on insects and mollusks: "When you finish your lecture, be sure you at once withdraw and do not allow the students to question you!" (E. L. Mark in S. E. Morison's "The Development of Harvard University Since the Inauguration of President Eliot, 1869-1929," 1930, p. 385.)

<sup>2</sup> See S. W. Geiser, "Naturalists of the Frontier," Southwest Review, 1929, pp. 184-198, and "Professor Jacob Boll and the Natural History of the Southwest," American Midland Naturalist, 11, 1929, pp. 435-452.

In 1890 Samuel Henshaw (1852-) took over the care of the entomological collections, and later (1899) of the Library of the Museum. In 1903 he became the Institution's Curator, a title which was changed to "Director" in 1911. Until 1916, when Nathan Banks was appointed Curator of Entomology, Henshaw evinced a keen interest in the subject. He is well known among entomologists as the author in 1885 of a complete list of the known North American Coleoptera, a work to which he added supplements in 1886, 1889 and 1895. He is also the author of a very useful bibliography of economic entomology in 5 parts, four of which were issued by the United States Department of Agriculture in 1890, the fifth in 1896.

Since Thomas Barbour succeeded Henshaw as Director of the Museum in 1927, the collections, under Banks' curatorship, have been moved into much more commodious quarters and have been increased to such an extent that three assistant curators have been added to the staff: Dr. P. J. Darlington has taken charge of the Coleoptera, Dr. M. Bates of the Lepidoptera and Dr. F. M. Carpenter of the fossil insects, while Miss E. B. Bryant has charge of the great aggregation of Arachnids.

Turning to the Bussey Institution at Forest Hills, we find that, as early as 1871-72, the first year of its existence as an undergraduate school of agriculture and horticulture, there was an instructorship of entomology, which was held by Francis G. Sanborn. This instructorship was permitted to lapse, however, in 1872, because much of the income of the Institution had been lost as a result of the great Boston fire. In 1879 the position was revived and given to Edward Burgess (1848-91), who taught till 1882 and again from 1883 to 1884. Burgess' services to the Boston Society of Natural History as its secretary, as an insect morphologist and subsequently as a naval architect were noteworthy.<sup>1</sup> Scudder seems to have aroused his interest in insect anatomy, which is the theme of most of the 22 papers he published. His most important contribution deals with the anatomy of our common milkweed butterfly (1880). He also edited (1875) the writings of the pioneer arachnologist and entomologist, Nicholas Marcellus Hentz (1795-1856).

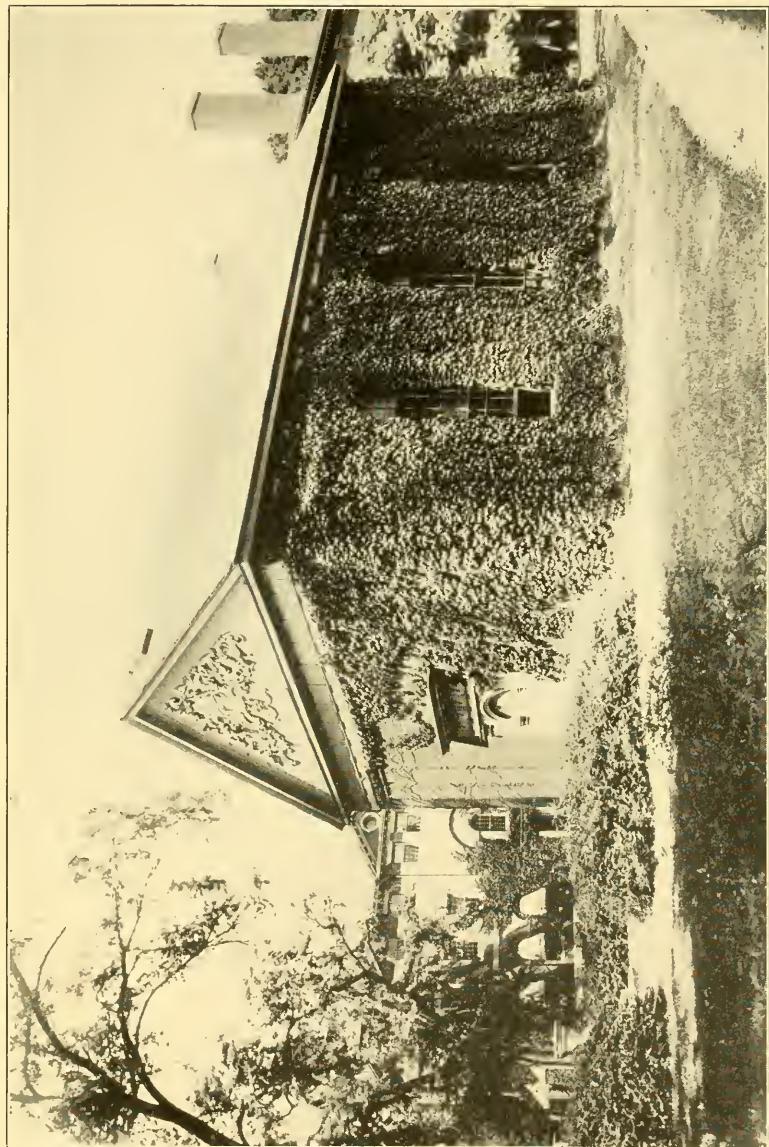
<sup>1</sup> S. Scudder, "The Services of Edward Burgess to Natural Science," Proc. Boston Soc. Nat. Hist., 25, 1891, pp. 358-364.

When the Bussey Institution was reorganized in 1908 for graduate work and research, I was appointed professor of entomology. A year later Charles Thomas Brues was added to the staff as instructor. During the following years, till 1929, when the Bussey Institution was merged with the Arnold Arboretum and we joined the Zoölogical Department and Museum in Cambridge, a considerable amount of research, especially on Hymenoptera (the Parasitica by Brues and the social Aculeata by myself), was undertaken and a number of young investigators trained as teachers and as economic entomologists. We also conducted during the second semester of each year, in Cambridge, general entomological courses designed primarily for graduate students.

The importance of entomology has been recognized in the development of the School of Public Health at the Harvard Medical School by the appointment of two assistant professors. For some years courses on insects as vectors of human and animal diseases were given by Professor Brues at the Bussey Institution, but in 1923 Dr. Joseph Bequaert took over this instruction as a member of Dr. Richard Strong's Department of Tropical Medicine, and more recently Dr. Marshall Hertig has been giving similar instruction on the insect parasites of domestic animals in Dr. Ernest Tyzzer's Department of Comparative Pathology. Dr. Bequaert, who has contributed much to our knowledge of the Vespid Hymenoptera, Diptera and other insects, is also an active member of both the Zoölogical and Museum staffs.

The preceding brief historical sketch shows that there has been at Harvard University not only an uninterrupted occupation with entomological teaching and research since the close of the eighteenth century, but also a continuous increase in these activities commensurate with those in other departments of zoölogy and all other natural sciences. In other words, the importance of entomology has been fully recognized without the undue exaggeration that has attended its development in some other American universities. Owing to the extraordinary number and variety of insect forms, entomologists have often shown a tendency, especially as occupants of professorial or official positions, to exaggerate the significance of insects as distinguished from the many other existing and extinct animal types. Not only has this tendency been noticeably absent among the teach-

ers of entomology at Harvard University, but there has been a very evident desire on their part to remain in close, sympathetic rapport with their colleagues in the other departments of biology. This desire, which has always been fostered by the continuously and harmoniously developing Museum of Comparative Zoölogy, has recently been increased by the housing in its immediate vicinity of nearly all the other biological departments in a single building.



*Photo from F. A. Ollison*

HOLDEN CHAPEL. THIS BUILDING HAS SERVED FOR A VARIETY OF USES. IT ONCE HOUSED THE MUSEUM



## THE EXHIBITION COLLECTIONS

BY

THOMAS BARBOUR

THIS little guide is intended to aid in answering questions which are constantly being asked concerning the specimens which have been placed on exhibition in this Museum, and it is intended likewise to serve as a brief description of the wealth of material available to research workers within its walls.

Louis Agassiz, who founded the institution as it is now organized, conceived a wholly novel and original plan, when he decided that part of the exhibits should be in their nature faunistic, representing the animals of the various zoögeographical regions, while the other rooms were to be in their nature systematic — or, perhaps better, in view of their inevitable limitation in scope, synoptic. In other words these halls are intended to give an idea of some of the varying inter-related types which make up each group of the animal kingdom. During the Museum's early days its collections were small, and the methods of preparation, especially of taxidermy, were primitive and undeveloped. The result was that masses of specimens were placed on exhibition often because there was no other convenient place to put them, and also because, through ignorance of the art of preservation, no one realized how inherently hideous some of these old specimens really were. A few of them still remain because of the difficulty or high cost of replacing them, but most have gone. Today our Museum serves a different purpose than that of the other great museums of the country. It is primarily a research institution, but by virtue of the articles of agreement made between the original trustees of the once semi-independent Museum of Comparative Zoölogy and the Corporation of Harvard University when it became a part of that institution, some exhibits must always be open to the public. In order that these exhibitions might be more instructive, they have been recently, to a large degree, rearranged, much new material added, and many old specimens discarded, although Louis Agassiz's original plan of geographical and systematic rooms has been retained.

One may enter the exhibition room of the Zoölogical Section of the University Museum (i. e. The Museum of Comparative Zoölogy) from two directions. Many visitors pass directly from the exhibit of Economic Botany to the Marine Mammal Room or to that in which the North American birds are shown. Many other visitors enter the Main Door facing the Quadrangle on Divinity Avenue. The guide book is arranged as if all visitors entered in this way. Other visitors may easily orient themselves by observing the numbers on the doors of the rooms and seeking the corresponding number in this guide.

On entering the ground floor of the main entrance one finds, in an alcove immediately at one's right hand, an immense slab of the remains of many individuals of the fossil Rhinoceros (*Diceratherium*) from Agate Springs, Nebraska. This slab, the largest of its kind ever collected, was taken from the side of a butte rising several hundred feet over the layer bearing the bony remains. The area is one where great herds of animals perished in quicksand which were probably later redeposited by river action. The bones will be observed to lie in extraordinary confusion. With the increasing drying up of the country, deposition of sand took place on a large scale. After long ages erosion cut away a large portion of this extensive deposition and exposed the bony-bearing layer. Descriptive and illustrative labels and pictures help explain this exhibit.

The four Alaskan Moose heads show noteworthy horn development; the one just to the left of the door being unusually massive.

In the alcove to the left is a slab of *Climactichnites* from northern New York. These tracks represent the resting impressions and the trails of a problematical animal which lived in very early geological times. Opinions differ as to whether these were the tracks of a mollusc, a crustacean or some creature as yet unknown to science.

In the hall beyond the stairway are portraits of Louis Agassiz and Alexander Agassiz and busts of Alexander Agassiz and Francis C. Gray, the Museum's first benefactor. On the wall opposite the portraits is the partially restored fossil skeleton of a giant flying reptile (*Pteranodon*). Great creatures of this nature flew, probably while fishing, over the ancient Cretaceous seas of Kansas, and falling into the shallow water were occasionally preserved in the ooze of the bottom — now a dry chalky deposit.

On an adjoining wall is a very fine skeleton of the primitive Trias-

sic Dinosaur, *Plateosaurus*, from Germany. This is the first specimen of this genus to be mounted in this country, and the mount is peculiarly graceful as well as scientifically convincing in all its details. Near this mount is shown the skull of a magnificent horned Dinosaur, geologically the most recent *Triceratops* ever found.

### ROOM 156

#### *Fossil Invertebrates*

This room has been arranged as an aid to the teaching of invertebrate palaeontology. The visitor will find synoptic exhibits of the various groups of invertebrate fossils, well labelled, and with restorations to show the way the animals appeared in life. Many of these individual specimens are too small and apparently inconspicuous to attract attention, at first, but a careful examination will reveal a host of specimens of great beauty and perfection of preservation. The Museum is most fortunate in having had great stores of material from which these exhibits have been chosen. The fossil insects, the trilobites, and the echinoderms are especially noteworthy.

### ROOM 154

#### *Fossil Vertebrates*

In this room are shown some of the primitive fish and fish-like vertebrates. The great head of *Dinichthys* is one of the finest ever found. This creature was probably not unlike a giant catfish in appearance. The bony head coverings are shown, the rest of the skeleton being of cartilage. It must be emphasized that *Dinichthys* was not a true fish — let alone a catfish. Its exact zoölogical position is uncertain.

The large, sluggish, mollusc-feeding, lizard-like *Diadectes* is noteworthy as being a rare find from the Permian of Texas. It represents a group of very primitive reptiles called the *Cotylosauria*.

The fossil tortoises are good, as are also the small flying lizards in the case by the window. The *Ichthyosaurs* on the wall were porpoise-like reptiles which swarmed in the Triassic Seas. In this room, as in the other rooms devoted to vertebrate fossils, extensive changes are planned as specimens now in the Museum are, one by one, mounted

for exhibition. The skull of *Boettneria* in the pedestal case is that of an early Amphibian and is marvellously preserved. It was taken from out of a very hard and refractory rock and required many months of the most skillful work to remove. Several skulls representing groups of extinct reptiles are very unusually perfect.

## ROOM 155

*Fossil Vertebrates*

The central group are Pliocene types from the Pampean formations of Argentina. These specimens were collected for Alexander Agassiz by Professor H. A. Ward and represent, unfortunately, but part of the collection secured, a large part having been lost when another ship bringing them north foundered off Fire Island, New York. The *Panochthus*, a Giant Armadillo-like animal, is very fine, and the *Toxodon* almost uniquely complete. The three genera of sloths are likewise noteworthy.

In this room there are also exhibited fossil birds. The skeleton of the great flightless *Aepyornis* of Madagascar, which is supposed to have given rise to the legend of the Roc, is shown near the similar but somewhat distantly related *Moas* of New Zealand. The remains of the *Dodo* from Mauritius and the *Solitaire* of Rodriquez Island, in the Indian Ocean, represent giant flightless pigeons. Two important and unique types of fossil birds are *Palaeospiza* and *Gallinuloides*. These are wonderfully preserved and are among the great treasures of the Museum. In this room the fossil fishes form a continuous systematic sequence with those in room 154. This exhibit of fossil fish is the most important representation of any vertebrate group possessed by the Museum. It is supplemented by the material in the study collections, but since fossils do not usually deteriorate, many of the finest specimens have been placed on public exhibition. This policy is not generally pursued in other departments of this Museum.

## ROOM 153

*Fossil Vertebrates*

In the center of the room is a group of mastodon remains — classics of their sort, for these are some of the specimens studied by Dr. John C. Warren and Professor Jeffries Wyman some eighty years

ago. These fossils were illustrated in Dr. Warren's famous memoir, published in Boston in 1852.

In the late summer of 1844 a drought dried up many ponds and marshes in the neighborhood of Hackettstown, New Jersey. In a small swamp on his farm, Mr. Abraham Ayers uncovered the remains of five mastodons — four adults and a calf. Very evidently the animals had been bogged, for three of them were buried standing upright; inclosed by the ribs of a couple of them Mr. Ayers found what he described as "coarse chopped straw" — remnants of the last meal.

Only one of these skeletons has come down to us in anything like its entirety; from ignorance and lack of proper care most of the bones of the others crumbled to dust soon after being exhumed, while other small parts were lost through carelessness. It was not till 1846 that a number of gentlemen of Boston, Cambridge, and Salem donated what was left to Harvard College.

The first attempt at setting up the skeleton was scarcely successful, as is obvious from the figure given by Dr. Warren. He was soon commissioned to improve upon it. With his assistant, Mr. Ogden, he made careful comparisons with a modern elephant and his own famous mastodon (now in the American Museum in New York), and mounted it just as it now stands, even to supplying, in cork, the missing foot bones. "The skeleton thus restored was transferred to Cambridge; and, in the latter part of the autumn of 1850, presented to the President of the University, the late Governor Everett, Professors Agassiz and Wyman, and the members of the Scientific School."

Except for a number of teeth and a few odd bones in storage, the skulls and jaws surrounding the mounted skeleton are all that remains of the other four mastodons. They are arranged to show the changes in dentition as the animal grows older. The small pair of jaws in the glass case is the youngest of the series. Next to it is an older stage, and at the opposite (front) end of the skeleton is a still older one. The skull of the second stage has been sawed in half to show the form of the brain case, as well as the great thickness of the covering bones, which are nearly as extremely developed as in a modern elephant.

On opposite sides of the skeleton are a shoulder blade and three dorsal vertebrae of an imperial elephant from Florida. Large as was

the mastodon, the imperial elephant was far larger — in fact, the largest elephant known.

In general this room is only partially installed, and will in time be largely rearranged. Noteworthy specimens are the sabretooth tigers, the evolutionary series of the fossil horses to show their increase in size and the reduction of the number of digits, the well-preserved three-toed horses, *Mesohippus*, the Scott and Osborn types of *Titanothere*s. The *Moropus* represents a group of mammals known as the *Chalicotheres*, which showed some relationship with existing herbivorous animals, and which had great claws instead of hooves, for what purpose is unknown. The two fine Irish Elk skulls, one on the wall and one with its complete skeleton, are impressive remains of the largest deer known.

#### *Upper Entry Hall*

This hall contains the Phillips Collection of Antlers and Horns. Here are not only many record heads, but a series, finely chosen, to enable one to appreciate the extraordinary diversity shown among the wild cattle, sheep, goats, deer and antelopes.

#### *Main Hall*

This hall contains a synoptic collection of Mammals. Attention is called to the charts on the walls which show the interrelationship of the various mammalian groups and the location of these groups in the cases. The specimens to which the visitor's attention is particularly directed are: the splendid Mountain Gorilla; the Père David's deer, extinct in a wild state; the Javan Rhinoceros, the rarest of all living allied species; the Okapi, the first ever brought to America; the Giant Giraffe and the European Bison, also on the verge of extinction. The Pygmy Hippopotamus from Liberia is a rare species and is shown with its skeleton, while the Zebra represents a race which is now extinct and which formerly inhabited the southern portion of the Cape Province, South Africa.

#### *The Gallery of Birds*

Surrounding the three great whale skeletons is the new synoptic collection of birds. This shows skeletons and mounted representatives of all of the principal families of the birds of the world.

## Room 352

*The Alexander Agassiz Memorial Room*

The exhibits in this room are built about the two Curtis Models of Coral Islands, which Alexander Agassiz had made for the Museum. The models, made from photographic surveys, give a most beautiful and vivid impression of Borabora and Funafuti in the Pacific Ocean. The former is a high mountainous island with a surrounding barrier reef, while the other is one of the most perfect atolls known.

The wall cases show some of the coral reef animals — the sort of creatures which a visitor collecting in, or indeed looking into, the limpid waters of the lagoons would find or see. The fishes of gaudy colors, the sponges, the lacy alcyonarian or horny corals are very beautiful. The encrusting hydroids are especially fine. Characteristic stony corals, molluscs, echinoderms and crustacea of the reefs are also shown. From the center of the ceiling hangs the life size model of a large octopus, and among the molluscs the giant clams, each valve weighing over one hundred pounds, are most impressive. The room is dedicated to commemorate Alexander Agassiz's great interest in the study of coral reefs.

## Room 354

*Synoptic Collection of Invertebrates*

This room is an abridged text book of elementary zoölogy. It was installed in 1928 by several specialists in the Museum. It shows the progressive complication of animal types from the protozoa or single celled animals to the immediate forerunners of the vertebrates. Many of the more delicate invertebrates, sea anemones, medusae or jelly fishes, some of the worms and naked molluscs, are shown in Blaschka glass models. These were made by the first member of the family who made the beautiful glass flowers shown in the Botanical Museum. The collection of insects is probably the most comprehensive of any on public exhibition. Special attention is called to the model of the giant squid and to the very large piece of precious coral which Mr. Agassiz secured many years ago in Naples. In the central cases some interesting examples of insect architecture are shown.

## ROOM 355

*A Synopsis of the Fishes*

The central cases show the most primitive of living fishes, the hag-fishes, lampreys (Myxinoids) as well as the higher sharks and skates, and also the most primitive of the bony fishes.

The wall cases beginning on the Northwest wall (just beyond the door to the reptile room) and continuing all the way around the wall cases to the door from the invertebrate synopsis contain a series showing the principal families of bony fishes ending with the Australian mudfish. This, one of the Dipnoi or Lung fishes, is allied to forms which gave rise to the Amphibia. Fish are difficult creatures to exhibit satisfactorily. The skinning, mounting and coloring require the highest skill, and it is only with great difficulty that so many well-mounted specimens have been assembled as are shown here. Some forms are so soft-bodied that it is necessary to show models in place of the actual specimens.

## ROOM 353

*Synopsis of Amphibia and Reptiles*

In the Northeast corner wall case will be found a few amphibians, the group represented by frogs, toads, the newts, salamanders and the legless Caecilians. This exhibit is admittedly inadequate, but shows a number of interesting forms and some illustrations of the development from larva (tadpole) to adult, as well as their methods of caring for their young. The curious meringue-like nest of Chiromantis, an African tree frog, is made of slime from the creatures body beaten up into a froth with its feet. While this is soft the eggs are laid therein. The mass hardens and forms a sort of cocoon in which they are protected until they hatch.

The central cases show almost all the species of crocodiles and alligators. The great skull from the Philippine Islands is the largest ever recorded, and the whole history of its capture is a fascinating romance (see label). What is probably the record skull of the Florida Alligator is shown nearby also. The large monitor lizard from Komodo Island is a handsome recent accession. Near this is a fine

suite of giant tortoises from the Galapagos Islands and the Islands of the Indian Ocean.

The wall cases contain many fine tortoises and turtles, among these the historic type specimens from which two of the species were originally described. The venomous cobras, the great bushmaster and the rattlesnakes are remarkable examples of taxidermy and were mounted in the Museum by Mr. George Nelson, who for many years has been its highly skilled chief preparator. It is impossible to show all of the groups of reptiles and amphibia in a small synoptic collection, but the most renowned snakes are shown, as well as many beautifully mounted lizards.

#### ROOM 306

##### *Holarctic Birds and Mammals*

The birds shown in this room are in general Old World representatives of birds which occur in our own country, and which may be seen in Room 302. In the case of the mammals, however, the collection is designed to show the homogeneity of the holarctic area — comprising northern North America, Europe and Siberia. Here may be seen, for instance, the European Red Deer and the American Wapiti — representative of the same stock. So also badgers from Japan, England and Montana show how closely alike are these related forms. As a Zoological Region this great area is a single entity. It is known now that many of the mammals of North America are comparatively recent arrivals on this continent. They came from Northern Asia, when Northeastern Siberia and Alaska were connected by one or perhaps successive "land bridges." Reciprocal migration apparently also took place in the reverse direction.

#### ROOM 304

##### *African Birds and Mammals*

The birds shown are some of the peculiar forms which are characteristic of the Ethiopian region. The whale-headed stork from the high Upper Nile is perhaps the most interesting as well as the rarest of these. While the collection is not a large one, it is sufficient to show how varied and extraordinary is the African avifauna.

The rest of the room contains some fine, if, perchance, somewhat crowded, examples of the mammals of Africa. The giant sable antelope from Angola is by far the finest specimen in the room, but the hippopotamus is also a fine mount. Some of the other antelopes are recently acquired, and are perfect examples of modern taxidermy.

In a special case may be found some of the characteristic birds and mammals of Madagascar. The highly characteristic lemurs, the peculiar insectivores and the very anomalous pig are among them.

### ROOM 313

#### *South American Room*

Next to the Holarctic Room, and entered also from the main hall, is the space devoted to showing some of the birds and mammals, as well as some of the shells and insects of the Neotropical region. The beautiful set of humming birds is very complete and has been newly installed to display their metallic colors to the best advantage. Among the mammals, the set of camel-like animals, i. e. the llama, alpaca, guanaco and vicuna, are worthy of note, as also the fine Huemul deer mounted by Carl Akeley and the big jaguar by James Clark. The West Indian seal is almost, if not quite, extinct, and the peculiar maned wolf of Paraguay is very rare in collections. There is also a small representation of some of the characteristic creatures of the Antilles and the Galapagos Islands.

### ROOM 311

#### *Indo-Asiatic Birds and Mammals*

The two tigers, one from tropical India and one from Mongolia, emphasize the wide distribution of the species and show the difference in the geographic races or subspecies inhabiting, one a frigid, and the other a torrid part of the species range. The giant Indian elephant was a famous rogue killed in Mysore by W. T. Hornaday, in 1884. The mount was considered a masterpiece of taxidermy forty years ago! The great gaur was killed by Hornaday in southern India at the same time. The Sumatran rhinoceros is rare, as is also the tiny Salvin's pig of India. The other mammals and birds are some of those specially characteristic of Southeastern Asia.

*Main Hall*

In the hallway are a number of significant special exhibits. Along one side is the series of birds' nests showing the progressive elaboration in avian architecture. Here are nests from the most simple to the most complicated and curious. In the flat table case are examples of "mimicry" in insects and a set of the gorgeous tree snails of the genus *Liguus* to show the range of variation within one compact and closely related group of species. A bronze plaque, a photograph and some exquisite drawing commemorate the work of M. Jacques Burkhardt, for long years the unrivalled artist who illustrated the Museum publications and who lived as a member of Louis Agassiz's household. On another wall is a long panel of a group of white herons rising from a forest pool. This is the greatest artistic treasure belonging to the Museum and was given to it by its creator, Frank W. Benson. Several portraits hang near it. One is Professor E. L. Mark, Hersey Professor of Anatomy from 1885 to 1921. The portrait of Humboldt formerly belonged to Agassiz. That of Agassiz was given by Captain C. H. Davis, U. S. N. Professor J. D. Whitney was long Sturgis Hooper Professor of Geology in the days when that chair was held in this Museum.

From the ceiling hang two skeletons, one that of the narwhal, the other one of the Museum's most valued possessions. It is the skeleton of Steller's sea cow, perhaps the most perfect known, collected by Dr. L. Stejneger, at Behring Island, 1882-83. The animal has been extinct over 100 years. In the stair well hang three pictures. One is a portrait of Audubon, from the estate of the late William Brewster, after, or perhaps in part by, Healey. The others, Audubon's two greatest masterpieces, were given by John Eliot Thayer to the Museum but shortly before his death. Their history is set forth on the tablets beneath them designed by C. Howard Walker, who also designed the Burkhardt tablet, and the one in the Agassiz Coral Reef Room.

Passing from the Main Hall one enters two more of the rooms devoted to zoögeography.

## ROOM 309

*Insular Faunae*

Here are some characteristic mammals and birds from Australia, New Zealand and the Papuasian area. The egg-laying mammals, *Ornithorhynchus* and *Echidna*, are important as well as the fine *Emu* and *Cassowary*. There is no part of the world where the parrots and pigeons are so abundant, both in species and individuals, and no part of the world where they are so beautiful in color as in Papua and Australia. Many of these are shown here. There are no native land mammals in New Zealand, except bats. The birds, however, are noteworthy for the number of peculiar endemic genera. Some of the most remarkable of these are shown, including several which are rapidly approaching extinction, such as the *Huia*, the *Kiwi* and the peculiar duck.

## ROOM 307

*Marine Faunal Associations*

In the case to the left of the door by which one enters from the Main Hall are shown characteristic pelagic organisms such as are found in the Gulf Stream. Here, again, are some fine Blaschka glass models. In the alcove in front of this case (on both sides) are some typical deep sea invertebrates. The giant crabs from Japan and the lovely siliceous sponges are well worth careful examination. Facing the center of the room are two exhibits, one of the common tidepool invertebrates of our own coasts, i. e. the types referred to in the American Text Books of Zoölogy, and those seen by students on their excursions to Nahant. The gigantic lobster claws are striking. Opposite are the common species similarly familiar to those going to the British or French (Northern) marine laboratories. The central cases contain Blaschka models of tropical invertebrates, chiefly holothurians or sea cucumbers. About the outer walls of the room are invertebrates of many classes from the shallow waters of tropical seas, the most interesting specimens being the giant corals from the Great Barrier Reef of Australia. In one corner case an exhibit has been arranged to show apparatus used in deep sea exploration. Many of the individual objects are of historical interest, having been the first of their kind to be made or used on historic expeditions.

## Room 305

*Domesticated Animals*

The contents of this room illustrate variation under domestication (notice the races of chickens and dogs), domesticated animals not used in America, and such matters as hybridism, albinism, and melanism. There is also an exhibit to show Mendelian inheritance.

## Room 301

*Marine Mammals*

(N.B. The Zoölogical Museum may also be entered through this room from the Botanical Museum.)

This room illustrates the manner in which four mammalian stocks have become modified for marine life; viz. the Sirenia or manatees and dugongs; the Cetacea or whales and porpoises; the Pinnepedia or sea elephants, seals and sea lions, and the sea otter. The unique series of sketches, mostly made from life studies or ample notes from fresh material, is by Mr. J. Henry Blake. Being the work of an artist, trained by Louis Agassiz, they are remarkably accurate. Mr. Blake was artist during the voyage of the S.S. Hassler, and through his long life has always been interested in whales and whaling, and had many unusual chances to sketch from life. His father-in-law Capt. Nathaniel E. Atwood of Provincetown collected many cetacea for the Museum.

The narwhal in this room is of especial interest since it is not only the first one ever to be mounted for exhibition in America, but it came from Newfoundland where it is now extinct. It was not so many years ago a uniform dull black, and continued to exude and to drip grease even fifty or more years after it was prepared. This has all finally been cleaned off and removed and the skin found to be in perfect condition. It was then repainted, from notes furnished by a member of the staff who once lived in Greenland, and who was perfectly familiar with the animal in life.

## ROOM 302

*The Thayer Room*

(N.B. The Zoölogical Museum is also often entered via this room which, with Room 301, connects with the Botanical Museum.)

This room contains the birds of North America. The superb collection of beautifully mounted individuals is a monument to the discriminating pertinacity of John Eliot Thayer, a benefactor of the Museum all his life. He made this collection and left it to the Museum at his death. Here the bird lover who observes afield may solve his problems of bird identification. The birds in this room might well have been shown in connection with those of the Holarctic Room, number 306, did the arrangement of the building permit.

Adjoining the Thayer Room, as one enters the Main Hall from this direction, there is an important case of extinct and vanishing birds. This includes two great auks, which are among the finest in existence; George Washington's pheasants, among the oldest mounted birds in America and some of Alexander Wilson's original mounts — from which he drew the plates for his American Ornithology. Among other objects of interest is the last net for taking Passenger Pigeons which was used in New England.

## THE RESEARCH COLLECTIONS

BY

THOMAS BARBOUR

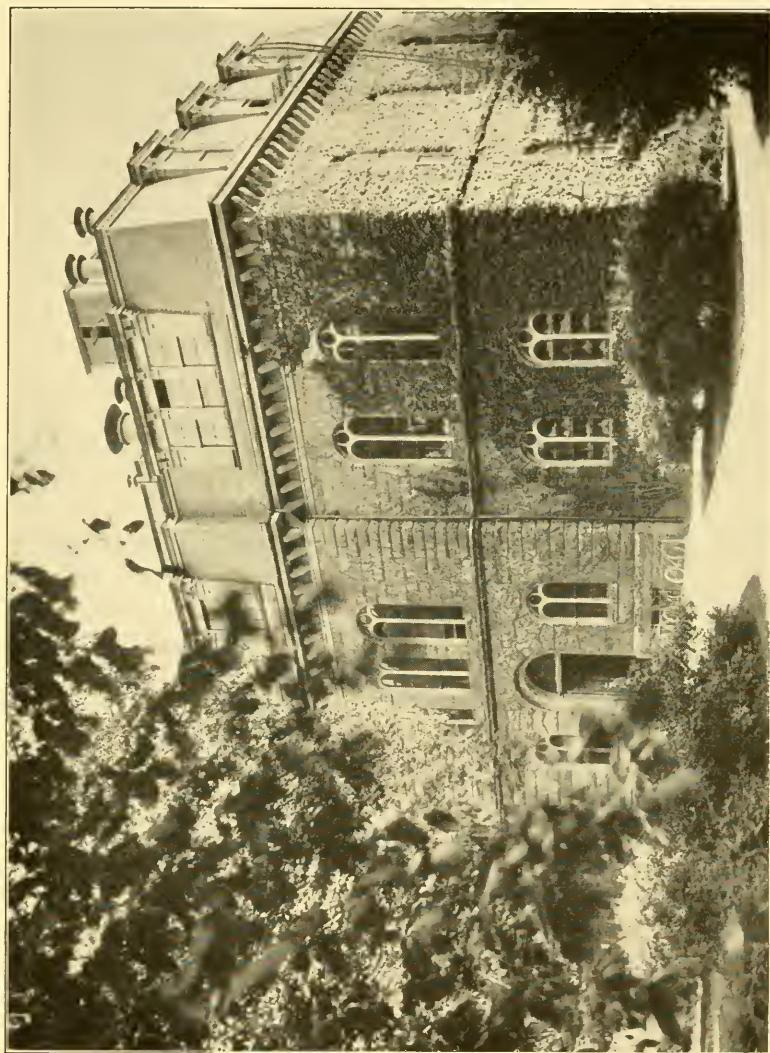
THE research collections of the Museum stand in the same relation to the student of systematic zoölogy, of evolution, of comparative anatomy or of geographical distribution that the library does to the student of law or history. Mr. John Stephenson of England, in 1928, defined systematic zoölogy in a singularly succinct and yet complete paragraph: as follows.

“The value of Systematic Zoölogy is generally understood, though perhaps still occasionally liable to depreciation. The first requisite in zoölogical work of any kind — morphological, economic, or any other — is to know what one is dealing with; before we can so much as begin on any other problem, we must know what our animals are — must have them described, named, and classified; and Systematic Zoölogy, which does this, is thus the bed-rock on which all other zoölogical research ultimately rests. Such work stands for all time; the first adequate description of a new animal is something which can never be duplicated, never repeated; it is there, once for all, as something to be appealed to, something that cannot, by the rules under which the systematist works, be superseded. It may seem to be of little interest at the moment; it may not be recalled for years; but it will be required, and will come into its own when much work in other branches has become obsolete through change of fashion or improved technique, or has been shown to be useless for any further advance.”

The Annual Report of the Museum for the year 1930-31 contained these remarks which emphasize and perhaps in some degree paraphrase what has been said before, and it may be recalled that emphasis is often gained by repetition. “The realization grows that in no way can so wide a grasp be gained of many aspects of animal life, such as a variation, of adaptation to environment, of distribution in time and space, and, above all, in the appreciation of the proc-

esses of evolution, as by working in a Museum in daily intimacy with its great collections. The Museum is no mere storehouse of dead and dusty trash, but is a living and vital center offering the same fascinating opportunity for, and incentive to investigation which comes to the student of history as he steps into one of the world's great libraries of books and manuscripts. The Museum's place in present-day biology grows more, not less, important as its collections grow and as it leads more men both to the cabinet and into the field and to consider the study of the life histories of animals as much a part of its natural activity as the study of those which are preserved."

A collection is, in some degree at least, valuable as it contains "types" or the original specimens from which species are described or specimens compared directly with types. So also specimens which have been figured in classical works and specimens which supplement fragmentary types, "plesiotypes" as they are called, are of the highest value. A fossil elephant may be described from a single tooth, but when the first perfect skull is found it becomes as important as the type, or perhaps more important. As the reader will observe in reading this account of the study collections, our Museum has been greatly blessed in that vast numbers of specimens to which naturalists will always want to refer have fallen into its care. If I were to be asked which are the most noteworthy types in the Museum, I should answer with a thrill, "The insects from Linneé's cabinet, which came with Dr. Hagen's collection, and the Hawaiian bird *Drepanis pacifica*, described by Lesson and collected by Captain Cook's Expedition." It is from this sort of bird, the Mamo, now wholly extinct, that the feathers were taken to make the gorgeous royal robe of Kamehameha the Great. On second thought I should add "the type of the gorilla."



*Photo, from F. A. Olson*

BOYLSTON HALL. THE SECOND STORY ONCE HOUSED THE MUSEUM



## *A Résumé of the Research Collections*

### THE MAMMAL COLLECTION

BY

GLOVER M. ALLEN

THE study collection of mammals, housed on the fifth floor of the Museum, ranks, in point of numbers and importance, about third or fourth among those in American Museums. Although its ultimate aim is to comprise a representation of the living species of mammals of the globe, this ideal is naturally still very far from being realized. Nevertheless, there is really an excellent series of North American species, including most of the genera and a good proportion of the described forms of living mammals. The mammals of the West Indies are well represented, and include such rare species as the two solenodons and all the known forms of Capromys and Geocapromys. South America, except Brazil, is still rather scantily represented; our collections from Europe and Northern Asia are better, and from parts of Southern, Eastern, and Western Africa better still, and very complete as relating to Kenya and Tanganyika Territory.

At present the collection contains about 35,000 skins and skulls, or more or less nearly complete skeletons of living species, and represents about 1800 species.

There are about 300 type specimens upon which names have been based. A large part of these are contained in the well known Bangs Collection of North American Mammals.

Other important collections are: the Loveridge and Schwab collections of African mammals, the large Australian and Chinese collections, as well as many others of greater or less extent added through frequent exchange, purchase, or gift, as well as through the work of field expeditions of the Museum.

A card index, by species, forms a ready guide to the material here available for study, and the collection itself is readily accessible for the use of properly qualified persons wishing to consult it.

## THE BIRD COLLECTION

BY

JAMES L. PETERS

THE study collection of birds, amounting to some 250,000 specimens, is located on the fifth floor of the North wing of the building. The synoptic collections in the public halls consist of mounted birds. The study collection, on the other hand, is in the form of "skins," that is, instead of being mounted in a more or less life-like attitude and fastened to a wooden stand, the birds are stuffed with a little cotton and laid on their backs in an attitude suggesting that of a dead bird. The skins are stored in trays in air-tight, light-proof cases and are available to scientists of standing and to accredited students for study. Whereas the exhibition collection contains one or more representatives of each family of birds, there is no practical advantage to be gained by endeavoring to display one of each of the 3000 genera or 25,000 species of birds known today. This is properly the function of the study collection, which contains nearly all the genera and nearly seventy per cent of the recognized forms.

This collection of bird skins was begun under the direction of Professor Louis Agassiz in 1859. It consisted at that time chiefly of local birds, and its growth for the first forty years was gradual. During that period the larger part of its acquisitions was by purchase or gift, though the Thayer Expedition in Brazil in 1865 and the Expedition to the Rocky Mountains in 1871 added many specimens. The Bryant Collection of North American and West Indian birds amounting to about 8000 skins was received in 1899. It was the first really large collection to be received by the Museum. The Bangs collection, received in 1909, added 25,000 birds from North America, Central and northern South America, including about 150 types and many rare and desirable species. Since the beginning of the present century the growth of the collection has been much more rapid and less haphazard. Efforts have been made to secure as many species and genera as possible from all parts of the world. The

John E. Thayer Expedition to China in 1907-09 yielded over 3000 birds, and was the first large collection of Chinese birds to come to this country. The following year 2000 skins, collected by F. B. Armstrong, in northeastern Mexico, were received from John C. Phillips. Since then several large collections from Mexico have been made by W. W. Brown. Underwood and Stadelman in Honduras have sent many thousands of birds to the Museum from both mountains and lowlands of that country. Expeditions to the West Indies, Central and South America, Africa, Asia and the East Indies have increased the representation from these regions. Exchanges with museums, both in this country and abroad, have added rare species not obtained on the museum expeditions. The collection of William Brewster, containing 40,000 skins from North America and Mexico, was received by bequest in 1918. The LaTouche collection of Chinese birds, which has been received by purchase, and the great collections made by Rock give the museum an essentially complete representation of the birds of China. Another valuable accession during the last few years is the Swann collection of hawks. The collection of Baron de Lafresnaye, celebrated French ornithologist of the middle of the nineteenth century, was turned over by the Boston Society of Natural History in 1920. In 1923 Mr. Homer L. Bigelow presented his collection of about 3000 skins of North American birds, all beautifully prepared. The Thayer collection of 28,000 skins was received in 1932.

The study collection contains, at present, about 1350 type specimens. In importance the collection ranks high among the great institutions of a similar nature in the world. In this country it is exceeded in actual number of skins only by those of the National Museum in Washington and the American Museum in New York. It is probably more complete than the former, while the latter is the largest and most complete in the world, and the next only to the British Museum in importance. Abroad our collection is exceeded only by some of the very much older bird collections such as those at London, and perhaps Paris and Leningrad. The collection of Chinese birds here is one of the finest in the world, and the same probably holds true of the birds of the West Indies. The representation of hawks is virtually complete.

In 1926 Mr. A. C. Bent, of Taunton, Massachusetts, deposited his

collection of North American birds, amounting, at that time, to about 12,000 specimens, and in the same year Mr. F. H. Kennard also deposited his collection of around 5000 specimens. Both of these collections are kept separate from the main collection, and while they will eventually become a part of the corpus of the collection, they are at present under the control of their respective owners, who are actively engaged in adding to, and improving, them. To these Mr. C. F. Batchelder, in 1933, added his collection of over 7000 skins, as a gift.

Since the foregoing pages were written the Harvard Australian Expedition has returned with many birds from Australia not previously in our series and with a good collection from Papua as well. Large collections have recently been received from central and southern Brazil.

The skins are all arranged in a single systematic series and form the most accessibly arranged large collection in existence.

There is a rather large and almost completely catalogued collection of birds' eggs and nests. There is much historical material, eggs taken by Audubon, and other early naturalists, but the collection has a long way to go before it can be called really representative. Under the care of the Department of Birds there is also a very valuable collection of skeletal material and a few important alcoholic specimens. This part of the collection owes much to Dr. G. M. Allen's industry and interest.

# THE REPTILE-AMPHIBIAN COLLECTION

BY

ARTHUR LOVERIDGE

THE reserve study collections of reptiles and amphibians in the Museum of Comparative Zoölogy are probably only excelled in variety of species by those in the British Museum.

The actual number of specimens is difficult to ascertain, as in former times one registration number was given to a series from one locality; latterly only up to twenty-five representative specimens from a large series have been entered. The rapid growth in the collections dates from 1903, a point easily verified by consulting the registers which were commenced in 1875. If we divide the fifty-six years covered by the registers we find that: in the 28 years covering 1875-1902, 9046 entries were made; in the 28 years covering 1903-30, 36,087 entries were made, and the entries tend to increase annually. It is probable that an estimate of 400,000 would give a fair idea of the total number of specimens in the collection.

At the last census taken (September, 1932) there were 5,147 distinct species or races represented in the collection.

At the present time there are holotypes or paratypes of about 1,500 species; a number which is continually being augmented.

In early days A. A. Duméril furnished the Museum with a selection of the material which had been used by his father, together with his colleague Bibron, in the publication of their standard work on the reptiles and amphibians. Many of Cope's types are in the Museum, for he reported on several of the earlier collections.

The collection is so uniformly representative that it is difficult to single out groups which are particularly good; it is easier to treat the collection from a geographical standpoint. There are, however, a few groups so nearly complete that they may be mentioned here; these are the Crocodylia; Chelonia; the sea snakes (Malcolm Smith collection) among the Ophidia; the Anoles (Barbour collection) among the Lacertilia; the Rhiptoglossa (A. Loveridge collections); and the Caudata among Amphibia.

*Europe.* While the majority of the species and races are represented, the collection cannot be considered rich in European material, and as comparatively little work is done here on European herpetology, there seems little purpose in duplicating series which may be consulted in the national collections of Europe. Collections of outstanding importance from the regions are those from Germany (W. Kukenthal), Austria (W. Wolterstorff), and Spain (F. Z. Cervera).

*Asia.* By exchanges with the Leningrad Museum a representative series of Northern Asiatic species has been secured, and of India from the Indian Museum. From the latter region R. H. Beddome contributed specimens, and M. M. Carlton made extensive donations of reptiles from the Kulu Valley. From China we have the collections of F. R. Wulsin and J. Graham, with J. T. Wright's perfectly preserved material from Indo-China and Annam. A. Owston's collectors worked in Formosa, on behalf of Dr. Barbour, who presented the resulting material and the types based upon it. From Siam, Celebes and Timor, collections were received from Dr. Malcolm Smith, and several fine consignments from the interior of Sarawak from Harrison W. Smith; from Borneo, small collections by W. T. Hornaday and E. Mjoberg. Edward Taylor's third Philippine collection, exceptionally rich in types, was presented by a friend of the department, as well as his own extensive East Indian collections, and a portion of the Douglas Burden-Emmett Dunn material from the same regions, so that it may be truly said that the Museum has a fine and representative selection of species occurring in this region.

*Africa.* The Franz Werner expedition, of 1928, rounded off the already almost complete series of the North African fauna, of the Mediterranean littoral. From the Liberian region was received the very fine collection made by G. M. Allen and his associates, who accompanied Dr. R. P. Strong on the Harvard Medical School Expedition. Over a long series of years G. Schwab has been contributing reptiles and amphibians from the Cameroons. The Belgian Congo series was enriched by some of the Herbert Lang-James Chapin material received from the American Museum of Natural History and more recently by specimens obtained by J. Bequaert. In 1925, W. S. Brooks visited South Africa, and the resulting material, when added to the old Layard collection, and to numerous speci-

mens received in exchange from the South African museums, gives us over two-thirds of the species known from the South of the Zambezi. From the East coast came the A. Loveridge collection of 1915-23, and later ones resulting from the expeditions of 1926 and 1929-30 and 1933, so that the Museum only lacks about thirty species from the whole region lying between the Tana and the Rovuma Rivers. From Somaliland and Ethiopia there is little material, and from the Sudan only a moderate-sized collection, made by Dr. J. C. Phillips and Dr. G. M. Allen. The collection made by F. R. Wulsin, in Madagascar, is a noteworthy one, and other material has been purchased, from time to time, but a lesser proportion of this rich fauna is in hand as compared with that from Africa.

*North America.* Since it is one of the objects of the National Museum to build up an extensive collection of North American forms, the Museum of Comparative Zoölogy has attempted to avoid any rivalry or overlapping in this direction, and has confined its scope to collecting but a small representative series of each race or species, but it has gratefully accepted, as gifts, series from the several faunal areas. North American Salamanders, largely E. R. Dunn's collecting, are well represented, and many of L. M. Klauber's beautifully preserved specimens will be found among the series of Californian reptiles; equally noteworthy are W. W. Brown's material from Arizona and Texas.

*Central America and West Indies.* The Museum has such extensive Antillean collections that only a few can receive mention. A large number of types resulted from S. Garman's collecting in this region, and in recent years Dr. Barbour has contributed quantities of material, not only from the Isthmus and West Indian Islands proper, but particularly from Cuba where he has collected on innumerable occasions. From the latter locality C. T. Ramsden also has sent many choice things. Some of the major collections were received from Mexico (W. W. Brown; E. R. Dunn; J. L. Peters; J. E. Thayer), Yucatan (L. J. Cole; E. Thompson), Guatemala (W. B. Richardson; A. E. Anthony), Costa Rica (H. S. Blair; E. R. Dunn), Panama (E. R. Dunn; J. B. Shropshire; J. Zetek). Haiti (G. M. Allen; W. J. Everdam; W. M. Mann; J. L. Peters and T. Barbour). The latter has collected on most of the West Indian Islands at one time and another and gathered much valuable material. Other collections that

might be mentioned are Swan Island (G. Nelson), Guadeloups and other islands (G. K. Noble), Porto Rico (G. M. Allen), Bahamas (C. J. Maynard and T. Barbour), Jamaica (T. Barbour; E. R. Dunn; G. Wright). Grenada and Trinidad (R. Thaxter).

*South America.* In Colombia the Museum has had numerous helpers, principal among whom are Hno. Nicéforo Maria, P. J. Darlington, and Dr. W. H. White. In 1872 the famous Hassler Expedition visited the Galapagos Islands, and reaped a rich harvest, providing many types. In recent times W. S. Brooks secured a small collection on the islands which filled certain gaps in the earlier series. Whymper's collections from Ecuador and G. K. Noble's from Peru likewise proved valuable. Garman's material from the Titicaca region is historic. In Chile, J. L. Peters and Carlos Reed collected; the former also spent some time in the Argentine. Most of our Bolivian collection was made by J. S. Steinbach and received in exchange from the University of Michigan Museum. Barbour, however, collected the types of a few interesting species in 1908. The Thayer Expedition to Brazil brought back vast quantities of reptile and amphibian life, and in recent years, through the instrumentality of Drs. Vital Brazil, Alipio de Miranda Ribero, Adolopho Lutz, and above all of Dr. Afranio do Amaral, the Brazilian snake collection has been made almost complete, with long series of well preserved specimens.

*Australia.* The first collections of consequence from this area were taken by Alexander Agassiz's expedition to the Great Barrier Reef. Latterly two members of the staff — Messrs. W. S. Brooks and Hubert L. Clark — have visited Australia and added to that collection, which has, however, been augmented from time to time by exchanges, carried out with the Australian Museums. Latterly the Harvard Australian Expedition, with Drs. Wheeler, Clark, Allen, Darlington and Dixson, as well as Messrs. Schevill and Ellis, have given this Museum one of the most complete, if not the most complete, representation from Australia in any museum.

# THE ICHTHYOLOGICAL COLLECTION

BY

NICHOLAS A. BORODIN

THE study collection of fishes of the Museum of Comparative Zoölogy comprises about 35,000 registered and catalogued units.<sup>1</sup> Besides that there are some unidentified and unregistered fishes, collected in the past by various expeditions and private persons, and a large collection of African fishes (about 600 specimens), collected recently for the Museum by A. Loveridge.

Within the last few years a considerable collection of fish skeletons, some 300 in number, has been added to the study collection of fishes.

The collection occupies five rooms of the basement and is placed in 36 cases with 410 sections; in each section are from five to nineteen trays.

Most of the fishes are in bottles, but some of the larger fish are in 116 copper containers, and still larger specimens are in two large tanks which serve especially for sharks, skates, sturgeon, etc.

During the last two years the whole collection has been revised, poorly preserved specimens destroyed, good ones rearranged and a locative card catalogue prepared.

The collection is not as rich in number of specimens as the collection of the United States National Museum, and probably not as large as the great collection at the University of Michigan, but the Museum of Comparative Zoölogy collection surely excels all other collections in America in the number of South American, Asiatic and European fishes.

The famous "Thayer" expedition to Brazil in 1866 resulted in bringing to the Museum of Comparative Zoölogy over 12,000 specimens of South American fishes. This huge collection has been used as the principal material for volumes of the ichthyological works by

<sup>1</sup> "Unit" means a single specimen or several specimens in the same container, bearing a separate number, under which it is entered in the catalogue. Sometimes it includes a dozen, or even a hundred fishes.

Drs. Steindachner, Eigenmann and others, and it is not yet exhausted: there are still many trays with Characin fishes unidentified and waiting for study. A considerable number of the South American fishes in the Museum were brought by the "Hassler" expedition of 1872.

The Museum possesses the collection of fishes made by the "Albatross" expeditions of 1890-91 and 1910, and about 500 specimens from the survey made by the steamer "Blake" in 1878-80. These collections were worked on by Dr. S. Garman and by Goode and Bean. Both include a great many deep sea fishes, in which the Museum might also be considered very rich, especially from the point of view of diversity of species. The collection of deep sea fishes has been greatly enlarged during the last two years. Two fine, recent collections were made by Mr. C. O'D. Iselin. Besides the sources mentioned above the study series includes many smaller suites of specimens from the "Anticosti" and "Fiji" expeditions, Professor Agassiz (Lake Superior), N. Pike (Mauritius), Poey (Cuba), Putnam (North America), L. P. Ward (Penang), Cooke (Zanzibar), T. Barbour (Celebes, Bermuda, Cuba, Bahamas), and C. Eigenmann (South and Central America). The Poey collection contains many of his types.

Many distinguished European scientists and the principal European museums, thanks to Professor L. Agassiz, contributed largely to the richness of the Museum of Comparative Zoölogy collection of European fishes; namely, Professor Haeckel, Dr. Klunzinger, Dr. Fr. Day, Stuttgard Museum, Lyons Museum, Museum of Göttingen, Museum of Milan, Zoölogical Museum of St. Petersburg (three considerable lots in 1885 and 1930), Riks-Museum of Stockholm, Museum of Natural History of Paris, British Museum, and the Pacific Scientific Fishery Research Station of Vladivostok, Russia.

The Museum of Comparative Zoölogy is one of the richest museums in types: all types of S. Garman (deep sea fishes, particularly Brotulids, Stomiatiids, Macrurids, Nemichtids and Plagiostomia); a great many of Eigenmann (Characins and Siluroids); many of L. Agassiz (Cyprinids and Percoids), Poey (Cuban fishes), Goode and Bean (deep sea fishes), Franz Steindachner (Characins and Siluroids), Tate Regan (Cichids), Cope (Cyprinids), Borodin (Characins and deep sea fishes), and some others.

The whole number of the types and cotypes in the Museum of

Comparative Zoölogy collection might be estimated at over 1000, but the task of searching these out and listing them is still very far from being finished.

#### TUNICATES

The collection of tunicates is entirely unidentified, and even unsorted. It consists of alcoholic material in jars and bottles, in many cases mixed with bryosoa, sponges and other invertebrates. It is impossible to say how many species are represented, of the approximately 1500 known, but a reasonable estimate would be about 200. As the collection has never been studied or catalogued, there is no type material. A large part of the collection came from the "Hassler" Expedition.

# THE ENTOMOLOGICAL COLLECTION

BY

NATHAN BANKS

THE collection today is the second in America; in several groups it stands first. The Coleoptera lead; our Museum containing the Leconte, Melsheimer, Ziegler, Dietz, Hayward, Blanchard, Double-day Harris and Carnochan collections, a set of the *Biologia Centrali Americana* and a set of the Bishop Hawaiian material and an immense number from various other sources. There are types of probably over 14,000 species, about one-half yet to be catalogued. A new Nearctic collection, based on the old, with the Bowditch, Dietz, Hayward and miscellaneous accessions added, is in progress of arrangement by Dr. Darlington. When this is done and the exotic material is more completely arranged we shall have a collection of which we may well be proud. The Chrysomelidae of Bowditch and the Cicindelidae of Harris are particularly valuable; the Cerambycidae and Curculionidae also contain a vast number of determined species. The recent Darlington collections from Australia add thousands of species to the collection.

Among the Lepidoptera the most valuable parts are the great collections of world-wide scope made by, and bequeathed by, Andrew J. Weeks and that made by C. T. Paine and given by Mrs. Richard T. Fisher; the S. E. Cassino collection with many types; the Geometridae (of Packard and Swett), the Microlepidoptera (largely Chambers and Dietz) and the Scudder butterflies. There are a number of exotic butterflies still unmounted, but a vast number of specimens have been pinned during the last few years. There are types of fully 1500 species, almost all of them catalogued. Mr. Cassino's gift of much of the Doll collection and the receipt of the great collection made by Stevens in New Guinea are among the most useful recent accessions, together with the enormous collections made by Bates and Darlington in the West Indies and by Bates in Panama and Honduras. The latter collection alone numbers perhaps 45,000 specimens.

The Diptera collection is especially valuable, containing the American material of Loew, Osten Sacken and Johnson. There are

types of about 2800 species, all catalogued, except those of the Johnson collection. There is not much recent material from the western states, and the exotic collection is very weak and undetermined except for recent Australian material, while the Antillean series is the best. There is a good European collection.

In the Hymenoptera we have a fair proportion of the larger species, but the collection of micro- and parasitic Hymenoptera is very weak, with the exception of the Cynipidae. Thanks to Dr. Wheeler, we have the best collection of ants in existence, and the Psammocharidae and Philanthidae are good and increasing in value. The Paul Herbst collection of Chilian Hymenoptera gives us a fine series from that country, otherwise the collection of exotic Hymenoptera, except for the ants, is not much better than the Diptera. There are fully 1200 types nearly all catalogued.

The Hemiptera is the weakest (of the large orders) in typical material, there being hardly more than 200 types. There is a considerable amount of United States material, largely of Banks and Morse collecting. For the exotics there is a large amount of material, mostly unstudied. The Meyer-Dür European collection is very good and has some types.

In the Orthoptera there are the rich collections of Scudder and Morse, about 1000 types. The exotic forms are numerous but mostly unnamed and unarranged. There is a generic card index for the Nearctic portion.

In Neuroptera there are the Hagen and Banks collections, now joined and forming probably the finest collection in the world, including about 2500 types. This is in numbered boxes and there is a generic card index. In the exotic Odonata there is quite a lot of unnamed material. The collection is growing steadily by original work as well as by exchanges and gifts.

In the smaller orders the collections of Thysanura and Collembola have the types of Packard and Banks and some of Folsom and MacGillivray. It is doubtless as good as any museum collection in the country. In the Anoplura, Mallophaga, Siphonaptera, and Thysanoptera, our collections are poor, as in most museums.

The Arachnida is the best collection in America, with about 2700 types. It contains the Emerton, Peckham, Bryant and Banks collections and many of Chamberlin's types. The spiders are in numbered

trays with a generic card index. The Opiliones have been arranged in the new trays, but the other groups are largely as they have been for some years. There is a vast amount of exotic material, much undetermined.

The collection of Myriopoda also contains much valuable material, largely of Chamberlin and Attems, probably about 700 or 800 types. The vials have been arranged in numbered trays and there is a generic card index to the named material. There is a large amount yet unstudied.

The collection of fossil insects has grown enormously through the recent efforts of Dr. Carpenter, and much of the identified material is catalogued, but the work is not yet finished. Most of the Scudder types are here, in all about 1500, while new forms are constantly appearing in the new collections.

The exotic insects came largely from expeditions, such as the Thayer Brazilian Expedition; the Uhler trip to Haiti; the Hassler voyage; the Barbour East and West Indian journeys; the several collections of Brooks in Bermuda, Jamaica, Trinidad, Falkland Islands, South Africa and West Australia; the numerous collections of W. M. Wheeler in Cuba, Panama, Costa Rica, Guatemala, British Guiana, New Zealand, Morocco, Hawaii, and especially Australia; the W. M. Mann material from the Solomons, Fiji, Mexico, Haiti and Brazil; the Davis Argentine collection; the Brues Grenada and Jamaica material; the Wight collection from Jamaica; the Banks Panama collection; the Allen and the Loveridge collections from East Africa; the Wulsin collections from China, West Africa and Madagascar; and particularly the great series of specimens gathered or purchased by Dr. Thaxter; and many smaller lots from others.

The insect collection is now in about 5000 drawers, except that the Blanchard, Bowditch Chrysomelidae and Harris Cicindelidae are in Schmitt type boxes; part also of the Hymenoptera are in Schmitt boxes, but they are being transferred. The Johnson collection is still in the original boxes, and so is much of the Bowditch general collection. There are still several hundred storage boxes with good material as yet unsorted. The collection of galls and the duplicate Orthoptera are also in storage boxes. The Arachnida, Myriopoda and many of the alcoholic insects are in upright vials arranged in trays.

# THE CRUSTACEA COLLECTION

BY

FENNER CHACE

THE collections of crustacea consist of a considerable amount of dried material, chiefly crabs, shrimps and barnacles, and a very large series in alcohol of all the various subclasses and orders. The bulk of the material consists of marine species collected by the "Blake" and "Albatross," but there is a considerable amount collected in the Pacific by the "Hassler," A. Garrett, Rev. B. G. Snow, and A. Agassiz. An important lot of Mediterranean material was purchased from the Naples Zoölogical Station. Smaller collections have come from various collectors connected with the Museum. The land and freshwater crustaceans have, for the most part, been accumulated in small lots by purchase, exchange, gift and collecting by members of the Museum staff.

The decapod crustaceans make up the bulk and most important part of the collection. The Macrura have been only partially worked up, so that much of the material is not even identified. The most important section is the notable series of Crayfish (*Cambarus* and its allies) upon which Faxon's great monograph of the group is based. This contains more than one hundred species and varieties of which more than one-third are represented by type material. The Brachyura (Crabs) are the most satisfactorily identified part of the crustacean collections. Although the cataloguing is quite incomplete, it is safe to say that there are more than 1000 species in this section, and more than 100 are represented by type material. Stomatopods, Schizopods, Amphipods, and Isopods are all present in large numbers, but almost nothing has been done with reference to their identification, except that a good start has been made on the labelling and arrangement of the Isopods. All orders of Entomostraca are well represented, but as no attempt has yet been made to arrange or even sort them, it is not possible to give any reliable estimate as to the number of species in the collection. Taken as a whole, however, it seems probable that the crustacean collection contains more than 3000 species.

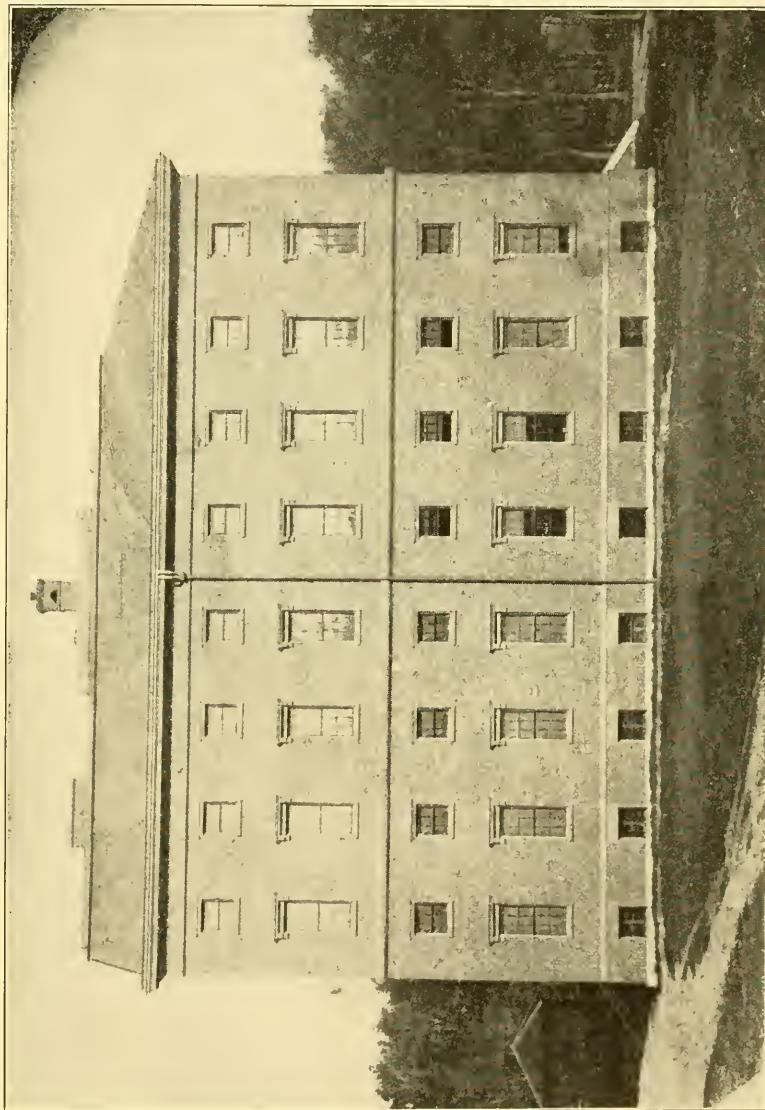
## THE COLLECTION OF ECHINODERMS

BY

H. L. CLARK

IN ITS collection of echinoderms the Museum of Comparative Zoölogy is probably first among the museums of the world, not only in number of species represented but also in the large series of specimens and in the large amount of type material gathered here. While the crinoid collection of the National Museum surpasses ours and is undoubtedly the greatest in the world, in the other classes it is not probable that our collections are equalled. There are approximately 5000 known species of echinoderms, and of these about one-half are represented in the Museum of Comparative Zoölogy. Nearly 1100 are represented by type material. The Museum collection dates back to the earlier days of the institution, for Louis Agassiz's interest in sea-urchins led him to make a collection of them and their allies before the present Museum was built. Securing the coöperation of men like Garrett, Captain Putnam, and Snow in the tropical Pacific, Cooke at Zanzibar and Pike at Mauritius, he added large numbers of specimens of many species to the collection, and interest in the group being continued by Alexander Agassiz and Hubert Lyman Clark, the series have never ceased to grow. Through the collection of the Coast Survey and Fish Commission steamers, especially the "Blake" and "Albatross," and the notable "Hassler" expedition, our accumulation of material has gone steadily on. Collections adding thousands of specimens and many new species to the Museum have been made in the West Indies, New Guinea and especially on several expeditions to Lord Howe Island and all parts of Australia. This has been done by members of the Museum staff. Exchanges with European, Australian, Indian and South African museums have also added much to our store. In recent years, a large amount of valuable material has been received in return for identifying collections for other museums.

The collection of crinoids now contains more than 4000 specimens



Photo, from F. W. Putnam  
THE EAST TIP OF THE NORTH WING OF THE UNIVERSITY MUSEUM BUILDING IN 1859. THE END OF THE  
PART NUMBERED I OF THE GROUND PLAN



of possibly 175 species (of some 700 known), including more than 50 types. Of asteroids, we have 16000 specimens, representing nearly 600 of the 1200 known species, of which 175 are types. Of ophiurans, there are more than 27000 specimens, of more than 800 species (of 1600 known), with more than 500 types. The collection of echini is the most complete, with more than 45,000 specimens, of over 500 species (about 600 known), of which 225 or more are represented by types. Of the approximately 1000 species of holothurians known we have some 350, about one-third of which (120) are represented by type material.

# THE COLLECTION OF FOSSIL ECHINODERMS

BY

R. T. JACKSON

THE collection of fossil echinoderms in the Museum is a very extensive one and is important in that it includes so many species, both American and European. It is also important from the fact that it contains numerous types and figured specimens as the result of the studies of many investigators who have made use of it in earlier or later years.

It is practically impossible to make even an estimate of the number of specimens in the several groups of echinoderms, but with the exception of what is on exhibition, the collection is all stored in wooden trays which measure  $26\frac{1}{2}'' \times 17''$  inside measure. The trays, with few exceptions, are nearly or quite filled, so that the number of trays occupied gives some adequate measure of the amount of material therein contained.

The main large collections, of which the Museum collection is made up, are as follows: the Louis Agassiz collection, mainly European; the Gustave Cotteau collection, mainly European echini; the Charles Wachsmuth and the William Barris collections, both mainly from the lower carboniferous of the western states; the first C. D. Walcott collection from New York State; the L. G. de Koninck collection from various formations in Belgium and other European countries; the L. Schultze collection from the Devonian of Germany. These important collections were all received during the administration of Louis Agassiz. Of other collections received, the second C. D. Walcott collection, mainly from the Ordovician of New York State; the C. B. Dyer collection, mainly from the Ordovician of Ohio; the F. H. Day collection, mainly Silurian of Wisconsin; the Schary collection from the Palaeozoic of Bohemia and the Haeberlein collection from the lithographic slates of Solenhofen, were all the gift of Alexander Agassiz. Recently much fine material was received from

the Boston Society of Natural History as the result of the changed plan of administration of that institution. These several collections noted mostly consist of fossils of various groups of animals of which the fossil echinoderms comprised only a portion. The Wachsmuth collection, as an exception, consisted mainly of crinoids.

Of investigators whose echinoderm studies were based to a greater or less extent on the material now in the Museum, may be mentioned Wachsmuth and Springer, later Springer alone, Schultze, James Hall, Meek and Worthen, C. D. Walcott, Charles Schuchert and particularly Robert T. Jackson.

Of the cystoids there are 56 trays. In this material there are a number of types and figured specimens, some 26 as recorded. Of blastoids there are 14 trays, including some 20 types and figured specimens.

The collection of crinoids is extensive, filling some 430 trays. This collection includes much very choice material from the Wachsmuth, Barris, Dyer and Walcott collections from America and the Schultze, de Koninck and Schary collections from Europe. There are 764 species and varieties of crinoids as recorded in the systematic card catalogue. This includes some 168 types and in addition 108 figured specimens.

Of the Stelleroidea, including both starfishes and ophiurans, there are 14 trays of specimens, which is a relatively large number for such rare fossils as is this group. There are some 22 types or figured specimens. Twelve of the specimens are figured in Dr. Charles Schuchert's recent revision of the Palaeozoic Stelleroidea.

The fossil echini may, for convenience, be considered under Palaeozoic and Post-Palaeozoic formations. Of Palaeozoic echini there are 45 trays. Some 138 valid species of Palaeozoic echini are recognized. Of these there are in the Museum collection specimens representing 50 species, of which 17 species are represented by type material. Some 57 of the Museum's specimens have served as the originals of published figures. Besides species represented by specimens seventeen additional Palaeozoic species are represented by casts, largely of the types.

Of Post-Palaeozoic fossil echini there are: of the Cidaroidea 21 trays; Centrechinida 34 trays; Holocrinida 15 trays; Clypeastrina 23 trays; and Spatangina 103 trays. This material includes many

choice specimens, especially from Jamaica and Cuba, and many type and figured specimens, including the Arnold and Clark types.

In the collection of Post-Palaeozoic fossil echini there are many casts that Louis Agassiz had made at Neuchâtel. A catalogue of these casts was published by Agassiz in 1870, and they are also recorded in Desor's "Synopsis des echinides fossiles," and in other publications. While not usually of much value for detailed study, these casts have a distinct historic interest and represent many species which are otherwise non-existent in the collection. Besides the Agassiz casts there are in the collection many casts of Post-Palaeozoic echini received from Cotteau.

## THE COLLECTION OF MOLLUSKS

BY

W. J. CLENCH

THE first report of this department appeared in the Museum's annual report for 1863. At this time A. S. Bickmore was in charge of the mollusks. But long prior to this date a vast number of shells had been brought together to make the nucleus of the collections which form what is now the department of mollusks.

The growth of the collection has not always been constant. During Mr. Anthony's term of office the collection developed to a remarkable degree. Mr. Anthony's industry and interest instituted a large correspondence with malacologists in all parts of the world and through them he obtained a vast amount of very important material. His recognition of the value of type specimens led him to exchange for material of this sort, which has resulted in a collection of considerable historical value. His chief interest was in freshwater mollusks, and he built up a series of American freshwater forms that for its time was superior to any collection in this country.

His successor, Mr. Hamlin, divided his time between recent and fossil species and as a consequence the collection did not advance with the same rapidity.

From the death of Mr. Anthony in 1877 until 1898 there was very little growth in the department. Dr. Walter Faxon's chief interest was in crustaceans, and little was added until the acquisition of the R. E. Call collection. At this time Faxon started the first catalogue of the shells. From the date of receipt of the Call material until 1923 the department's growth has been very rapid. Several very large collections were obtained and incorporated into the main body of material.

Mr. Clapp (1911-22) revised the collection and a vast amount of work was accomplished by him.

In 1926 William J. Clench took charge, and a very large amount of material has since been added.

There are probably 5000 species of mollusks of which we have some sort of type material. With few exceptions, all of the collections obtained during the past thirty-five years have contained some type specimens; before that the proportion of type material was much greater.

When fully catalogued there will be more than 160,000 lots, representing about 30,000 species and subspecies.

Many persons have gathered rich material during their explorations, among them T. Barbour,<sup>1</sup> who has made about thirty foreign collecting journeys; W. S. Brooks, who has collected shells for the Museum on most of his trips; W. M. Mann, who has enriched the collection with species from the Solomon and Fiji Islands of his own taking; and the Honorable W. C. Forbes, who donated an exceedingly large series of Philippine mollusks, largely collected for him by C. M. Weber, while Forbes was Governor General of the Philippine Islands.

Important additions have been received from H. L. Clark from the West Indies and Australia; Arthur Loveridge, mainly from Africa; Jack Sandground, from Africa; W. S. Schroeder from the deep water areas off New England; Joseph Bequaert from Yucatan and Africa; A. F. Archer from New England and Cuba. The many journeys by W. J. Clench with friends of the Department and former members of the staff have also yielded rich material, especially from the Bahama Islands. The Museum has also recently received the great collection of Cuban Mollusks, given by Dr. Pedro Bermudez.

Earlier records show the accession of material from Gulick, Benson, Bland, Binney, Cisneros, Cooke, Dohrn, Garrett, Godman, Morelet, Hirase, Pike, Prime, Putnam, Wright, Yates, and a host of other naturalists who in their time carried on extensive exchanges with the Museum.

The past few years have again seen increased activity in the line of exchanging with many of the present day naturalists.

Expeditions such as the Hassler and Thayer, and explorations by the vessels "Albatross" and "Blake," have contributed largely in the

<sup>1</sup> Many of the very large West Indian collections made by Dr. Barbour, the members of his family and other associates were made possible only because of the transport facilities offered by Mr. Allison V. Armour's Research Yacht *Utowna*. The Museum is very greatly in Mr. Armour's debt.

field of marine mollusks. The types of the Blake mollusks are contained in this collection.

The following list comprises some of the large collections received, through either purchase or gift, but in general not on single explorations:

- 1864 J. G. Anthony collection — mainly freshwater species.
- 1868 T. Bland collection of North American land shells.
- 1869 W. G. Binney, collection containing some of his own and some of his father's published material.
- 1874 Pease collection — mainly Pacific Island shells.
- 1880 "Blake" mollusks — marine, mostly West Indian.
- 1896 Prime collection of Corbiculidae.
- 1898 R. E. Call collection — mostly American freshwater mollusks.
- 1898 Balestier collection — Indo-Pacific marine forms.
- 1901 Godman collection (part) material published in the Biol. Cent. Americana.
- 1906 H. W. Winkley collection — collection of land shells.
- 1910 W. G. Binney collection — North American land shells.
- 1911 W. F. Clapp collection — general east coast marine.
- 1912 Smith and Clapp collection — New England and Florida shells.
- 1913 Arnold collection — general.
- 1913 Quadras collection (part) — Philippine land shells (from W. F. Webb).
- 1914-30 Boston Society of Natural History — many hundreds of lots of shells other than New England, including the first set of the Gulick Achatinellidae, with his types.
- 1915 Bryant Walker (part) — duplicates from the collection.
- 1918 W. C. Forbes collection of Philippine mollusks.
- 1918 Mosier collection — Liguus from Florida.
- 1918 Barbour and Brooks — general, from Florida.
- 1918 Hirase collection (part) — Japanese shells.
- 1918 H. W. Winkley collection — New England.
- 1919 C. A. Stearns — general collection.
- 1921 Shurteff collection — general.
- 1921 A. F. Gray collection — general.
- 1922 N. A. Clapp — series of Maynard Cerionidae.
- 1926 Pearse collection — mainly Florida shells.
- 1926 W. J. Clench collection — mainly land and freshwater.
- 1927 M. D. Barber collection — mainly Tennessee.
- 1928 N. W. Lermond collection — general.
- 1929 T. Bland collection — West Indian land shells.
- 1929-30 J. N. Farnum — two very large collections of Liguus from Florida.
- 1930 J. Bequaert collection — African land and freshwater.

- 1930 W. F. Webb collection — Clausiliidae.
- 1930 Maynard collection — Cerions.
- 1932 Bequaert collection — general.
- 1935 Bermudez collection — Cuban.

Not only the first Gulick collection but two other sets are in the Museum, making in all 14,201 specimens of Achatinellidae from this one source. With the Pease material this gives the Museum a most noteworthy representation of the Hawaiian landshells, so many of which have become extinct.

## THE COLLECTION OF VERMES

BY

J. H. SANDGROUND

THE collection of worms and the allied groups usually thrown together under the name Vermes is all in alcohol (except a considerable amount of dry Bryozoan material) and is only sorted out into the major groups. Much of the marine material has come from the "Hassler," "Blake," and "Albatross" collections, while the fresh-water and land forms have been received from a great number of sources, mostly as incidental collections made in connection with gathering other material. Of the Annelids, a considerable number, perhaps 200 species, have been identified, and of many of these, possibly 50, there is type material. The Sipunculids have been studied and the collection is identified and labelled. It contains about 40 species, of which some 12-15 are represented by type material. Of the small group of Myzostomes there is a valuable series of microscope slides, showing the structure of many species, including a type, the gift of Professor W. M. Wheeler. In the other groups, many individuals are identified, but on the whole the collection offers a virgin field for a systematist.

# THE COLLECTION OF PARASITIC WORMS

BY

J. H. SANDGROUND

THE establishment of a division of helminthology is one of the very recent innovations of the Museum. Rather than an innovation this might perhaps be termed a revival, for the development of a helminthological collection in the Museum probably started when Dr. D. F. Weinland, whose name is well known in the literature on the subject, was called from the Museum of Berlin to become associated with Professor Agassiz in the study of the then little known fauna of America. Weinland records having made extensive examinations of American animals for parasitic worms, but what became of this collection is unknown.

That considerable interest must have obtained in the field of parasitology is attested by the large and heterogeneous collection of tubed specimens, donated by numerous investigators in various branches of zoölogy, that had accumulated and were brought to light with the recent reorganization of the various collections. The absence of anybody on the Museum staff equipped with special knowledge in this important and rapidly growing subject led to the neglect of this material. When the present curator was appointed in 1928 to take charge of and build up the collection, much of the old material had to be discarded because of bad preservation, desiccation and the absence of labels carrying the necessary information for the proper identification of specimens. Among various smaller series that could be salvaged from the old collection was a number of tubes containing the types of North American Gordiacea described by Montgomery in a bulletin of the Museum in 1898.

The collection, as it stands at present in the catalogue, is still very small when compared with collections in those few American institutions where helminthology has been a continuously living interest.

While many of the major divisions of the several classes of parasitic worms are still unrepresented, we already have 130 species of 76 different genera of Nematoda, eight species of eight genera of Acanthocephala, 43 species belonging to 22 genera of Cestoda and 21 species of 16 genera of Trematoda. Even this small collection contains the type specimens of about 20 recently described forms.

Awaiting study and identification are three very extensive collections made by Dr. Ralph Wheeler in Assam, by Mr. Loveridge in Tanganyika and by Dr. Sandground in his recent trip through Rhodesia and Mozambique. Because of the recent affiliations with the Department of Tropical Medicine in the Medical School, the collections are growing satisfactorily in their representation of parasites of economic importance.

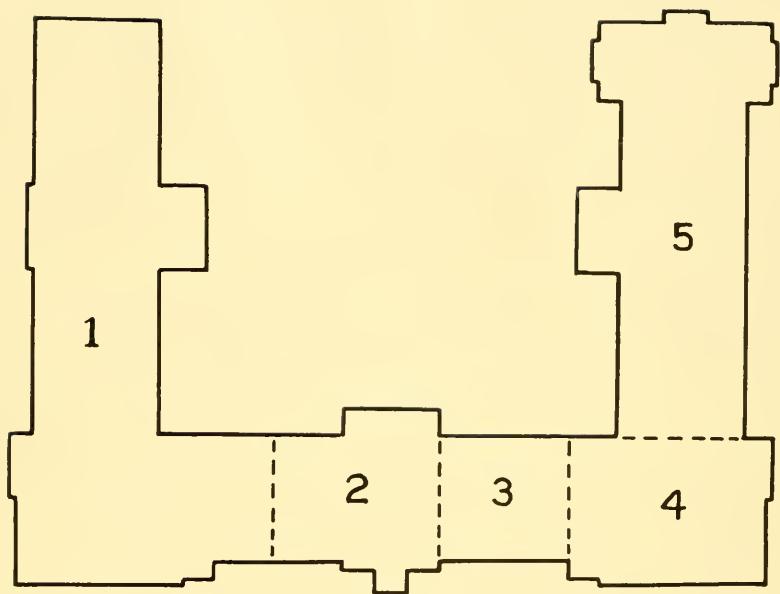
# THE COLLECTION OF COELENTERATES

BY

H. B. BIGELOW

THE foundations for the present collections were laid in the sixties when the interest in the marine fauna of the American waters was awakened. Some of the oldest specimens (mostly horny corals) were collected by Louis Agassiz from various places off Florida, Charleston and Maine, etc., and a very complete representation of the Alcyonarians of the west coast of Central America was brought home by Alexander Agassiz from his first trip to Panama. Some specimens probably date from much earlier accessions to the University's cabinet of Natural History. The New England fishermen showed early great interest in the Museum and gave quite large collections of horny corals and pennatulids from deep water. The first scientific expeditions, under L. F. de Pourtalès, brought an abundance of material from the waters around Florida, later the Hassler expedition made a cruise around South America, and in the eighties began a number of large expeditions under the leadership of Alexander Agassiz, with the "Blake" and the "Albatross," first in the West Indian waters and later as government expeditions to various parts of the Pacific Ocean, and that implied that the greater part of the collections, including all types, went to the United States National Museum in Washington. In the last twenty-five years only few additions have been made to the collections of the horny and stony corals, while the pelagic coelenterates and hydroids have steadily increased in number through gifts from all parts of the world, from the United States Fish Commission, the Canadian fisheries, the Australian Museum, the Philippine Bureau of Science, the Arcturus Expedition, etc.

About 3500 numbers of specimens already determined have been catalogued by Dr. H. B. Bigelow (mostly pelagic coelenterates and hydroids), and about 1000 lots of partly undetermined material



GROUND PLAN OF UNIVERSITY MUSEUM. TO SHOW SPACE FOR 1, M. C. Z.;  
2, BOTANICAL MUSEUM; 3, MINERALOGICAL MUSEUM; 4, GEOLOGICAL  
MUSEUM; 5, PEABODY MUSEUM OF ARCHAEOLOGY AND  
ETHNOLOGY



still awaits being catalogued. There are about 10,000 specimens of pelagic coelenterates and hydroids and probably 2000 other forms (alcyonarians, stony corals, anthipatids, actinians).

The determined part of the collections contains:

About 150 species of hydroids, chiefly West Indian, with about 30 types,

About 450 species of pelagic coelenterates, from all parts of the world, with a few types,

About 100 species of stony corals, chiefly West Indian, with 35 types,

About 150 species of alcyonarians, from the West Indies and west coast of Central America, with about 30 types.

The undetermined part of the collections contains about 700 trays of stony corals, 50 trays of horny corals and a few actinians, anthipatids, medusae, millepores, etc., but the number of these unnamed specimens has greatly diminished since Dr. Elisabeth Deichmann became first Alexander Agassiz Fellow and then Curator and has been caring for this material.

The collections of pelagic coelenterates rank among the best in the world. With regard to alcyonarians, stony corals and hydroids the Museum has, through the Blake material, secured the most complete series of species from the West Indian waters, and the Blake material has been the foundation for several important monographs from that region. There are also quite extensive collections from the west coast of Central America and Brazil.

## THE COLLECTION OF SPONGES

BY

ELISABETH DEICHMANN

THERE are about three hundred trays of dried specimens of sponges, and about five hundred and fifty more of these are kept in alcohol. The "Blake" material from the West Indies, treated by P. Schmidt in 1879, contains about fifty types. The remaining part of the collection consists of the material which von Lendenfeldt used for his large monograph on the Pacific sponges, secured by the "Albatross" 1904-05, but of this collection the types are in Washington. There are a number of common forms from various parts of the world. Few additions have been made in the last twenty-five years, and the collection needs a specialist who will build it up.

## THE FOSSIL MAMMAL COLLECTION

BY

H. C. STETSON

ACCESSION No. 1 in the register of the Museum of Comparative Zoology happens to have been a fossil mammal. Other collections in the Museum have subsequently outstripped this division of the palaeontological department, both in size and in value, but the distinction remains. On August 14, 1849, Professor Louis Agassiz arose before a meeting of the American Association for the Advancement of Science in Harvard Hall and described a tusk, a tooth, some foot bones and a rib of a fossil elephant found during the construction of the Rutland and Burlington Railroad at Mt. Holly, Vermont.

The first large collections were made by Garman and Clifford, who were sent on expeditions into the Bad Lands by Alexander Agassiz. In the early days of collecting in our west, a common method was to drive around in a wagon and pick up specimens which had already weathered out. Digging was at a minimum. In spite of these crude methods much material of importance was added, chiefly from the White River, including many specimens which later became types. On the 1880 expedition Garman discovered, in the Pleistocene of Nebraska, the skeleton of a ground sloth which is still one of the most perfect ever found in North America. Somewhat later C. H. Sternberg collected considerable rhinoceros material from the Pliocene of Kansas. From that time down to the first of the Schlaikjer expeditions in 1925 practically no material was received from the rich Tertiary faunas of our west.

In 1887 Alexander Agassiz bought the Rossignol collection, which contains some of the choicest material ever acquired. This comprises many beautiful specimens from the Eocene phosphorites of the Paris Basin. Most of the specimens are extraordinarily preserved, and can never be duplicated because the quarries have been destroyed in the process of mining gypsum. The European Tertiary is further represented by three major collections, the Duval, Brönn and Eser, as

well as by several smaller ones. These comprise many types as well as much study material.

In 1890 was added one of the most important acquisitions in the Museum, namely the mounted group of ground sloths, a glyptodont and a complete *Toxodon* from the Argentine pampas. This group has been mentioned in the Museum guide.

More recently the Gibbes, Frost and Wilson collections have been acquired, comprising, in large part, Cetacean material from the Tertiary of South Carolina. The Pleistocene of Cuba is well represented by material, chiefly rodent, collected by Messrs. Barbour, Brooks and Warner, and by the Moreno collection which contains many specimens of ground sloths. The same period in Florida is very thoroughly covered by the recent excavations of C. P. Singleton, who was financed by a friend of the Museum. From Mr. Childs Frick we obtained several fine bison skulls from the Pleistocene of Alaska.

From 1925 on, the choicest material has come from the Schlaikjer expeditions to South Dakota, Nebraska and Wyoming. Part of the Earl Douglass collection was acquired in 1931, and more recently the Harvard-Australian expedition obtained several specimens of fossil marsupials of that isolated continent. Much of the material from the later expeditions is of exhibition rank, and has been described in the guide to the Museum. Suffice it to say that exhibits of fossil mammals have now been developed sufficiently to form an important aid in teaching the various courses in palaeontology.

# THE FOSSIL FISH COLLECTION

BY

H. C. STETSON

FOSSIL fishes are comparatively rare; therefore the collection must necessarily be small as compared with the invertebrates, or even with other vertebrates.

As ranked with other collections in this country it is possibly in second place, taken as a whole, although several museums exceed it in special local collections. The accessions are mostly old ones, and beginning with 1908 the collection lay untouched for almost twenty years.

The nucleus is the Louis Agassiz collection, which consists of such European material as Professor Agassiz brought over and which was early secured for the Natural History Collections of Harvard College. The next large accession was the acquisition in 1862 of part of the famous collection of the Earl of Enniskillen. It consists of Palaeozoic sharks from the British Isles, and is unrivaled in this country. Two small collections were also acquired in the sixties, the Marder Collection in 1861, likewise British Palaeozoic sharks, and the C. F. Hartt collection of Teleosts from the Cretaceous at Ceará, Brazil.

Nothing was added till the eighties, when in close order came the Sternberg collection of the large predaceous Teleosts from the Kansas chalk in 1881, the Haegerlein collection from Solenhofen in 1882, the very large Stock collection of Ganoids from the Scottish Coal Measures in 1884, and the Terrell collection from the Cleveland Shale in 1885. These were all gifts of Alexander Agassiz. The Haegerlein collection is the finest, from the Lithographic limestone, ever brought to this country. The Terrell collection has yielded the fine specimen of a large Arthrodire (*Dinichthys*) now on exhibition. Large collections of Teleosts from the Eocene of Monte Bolca, Italy, and from Wyoming were also given by Alexander Agassiz. The preservation of fish from these localities is perfect and they make very attractive

exhibits. Through the acquisition of several collections a large amount of Devonian material from Iowa was obtained in the nineties. Of recent years other important acquisitions have been made, such as the collections of Silurian and Devonian Ostracoderms from Scotland secured by H. C. Stetson or by his interest, some very fine specimens for exhibition from Europe and the Cretaceous of Kansas, and last of all the material secured by Mr. Schevill in Australia. His *Portheus* on exhibition is superb. The fossil fish types in the Eser collection were transferred to the Museum from the Boston Society of Natural History but a few years ago.

The collection contains upwards of 12,000 specimens, including 250 types.

# THE FOSSIL REPTILE AND AMPHIBIAN COLLECTION

BY

H. C. STETSON

THE fossil reptile collection in storage was until recently very small. The largest accession is the Sternberg collection of 1882 from the Texas Permian, among which are some most important remains of *Seymouria* which have recently been uncovered, as well as a fine skull of *Captorhinus*. There is some excellent Triassic material: *Mystriosaurus* and *Ichthyosaurs* from England and Germany; a fine *Phytosaur* from California; and, lastly, the Singleton collection of Pleistocene turtles from Florida. Many of the most valuable fossil reptiles are exhibited, but they are always removable for study by qualified students. The Australian *Plesiosaurs*, recently collected, have been only partially studied, but they are the largest ever found. A *Diadectes* has been mounted.

The amphibians contain three rather valuable accessions — first a collection of *Stegocephalians* from the Lower Permian of Lebach, Germany, part of the old Bronn collection; secondly, several good *Stegocephalian* specimens from the Linton Coal Measures of Ohio and a few *Batrachians* from the Miocene of Germany; and fine representatives of the genera *Eryops*, *Buettneria* and *Diplocaulus*.

There are, however, only about twenty types in this department.

Since the above was written Dr. A. S. Romer has become Curator of the Department, and fruitful expeditions have yielded large collections of fossil reptiles from the Permian of Texas, as yet largely unstudied.

# THE INVERTEBRATE FOSSIL COLLECTION

BY

P. E. RAYMOND

THE collection of invertebrate fossils is stored in cases in five large rooms. In addition to those under the direct supervision of the curator, there are separate series of fossil echinoderms and of fossil insects. The greater part of the collection is arranged in zoölogical order, but recently an attempt has been made to build up another series, in which the arrangement is chronological, by geologic ages.

Louis Agassiz was the first to accumulate great numbers of invertebrate fossils, and the bulk of the material reached the Museum through his efforts or those of Alexander Agassiz. Some of the earlier accessions are of great historic interest, containing material collected by Louis Agassiz himself, and specimens presented to him by Sir Charles Lyell. Of similar interest and importance are collections from Jules Marcou, particularly from his "Dyas," Bohemian fossils from Barrande, specimens collected by J. B. Perry, an early curator in the Museum, a large European collection from de Koninck, and the Alpheus Hyatt collection of cephalopods. Outstanding for their large size and importance are: the Day collection, chiefly from the Silurian near Milwaukee, especially rich in cephalopods and trilobites; the Rust and Walcott collection, largely Ordovician, containing an unrivalled series of trilobites, including the thin sections which first demonstrated the presence of appendages, and thousands of brachiopods and bryozoans; the Schary collection, the greatest assemblage of Bohemian Paleozoic fossils except that in Praha, including many of Barrande's types; the Schultze collection from the Devonian of the Eifel district, especially rich in brachiopods and containing types; the de Koninck collection of Carboniferous, Mesozoic, and Tertiary fossils, largely from Belgium and France, representing many classic localities; the Dyer collection from the Ohio Valley, containing thousands of specimens of brachiopods, trilobites, and cephalopods; the St. John collection, chiefly Carbonif-

erous from the Mississippi Valley; the Gebhard collection from the Lower Devonian of the Schoharie Valley; the Taylor collection from northern New York; the Haeberlein collection of choice crustaceans, cephalopods, and other fossils from Solenhofen; the Eser collection, rich in the invertebrates of Europe; the numerous ammonites of England, purchased from B. M. Wright; the Michelotti collection of Tertiary fossils from Italy; the Campiche collection and the Boucault collection, both abounding in Tertiary mollusks; the large collections of European fossils obtained from Fritsch, Bronn, and Duval; altogether providing us with a remarkable assemblage of European invertebrates. Other collections which have added greatly to the value of the aggregate are those of Robert Tracy Jackson, gathered during his many years at Harvard; Tertiary fossils collected by W. B. Clark and J. B. Woodworth; and the great mass of material collected by Nathaniel Southgate Shaler on his expeditions to Anticosti, the southern states, and Europe. Among smaller but important collections should be mentioned one purchased from James Hall, and an excellent series of ammonites, including some types, which came from S. S. Buckman. Another small but important collection is that brought from California by J. D. Whitney, which contains some of Gabb's types.

The collection of Protozoa is small, but we fortunately have material from several European localities not now available to the collector. The small collection of sponges is fairly representative, but should be enlarged. The Hydrozoa include a good representation of Ordovician graptolites of eastern North America and Sweden, and from the Silurian of Bohemia. These three collections together occupy about two hundred drawers.

The collection of corals is a large one, occupying about eight hundred and fifty drawers. There is a very large representation of Paleozoic corals of both America and Europe, and a smaller number from the Mesozoic and Tertiary of these continents. Its outstanding feature is the Davis collection from the Falls of the Ohio, which contains many types.

Worms are represented by only a small collection, these animals not being common as fossils. The recent accession of a large number from the Mid-Cambrian of British Columbia might be mentioned. There is a large collection of bryozoans, occupying about one hun-

dred and fifty drawers; chiefly Paleozoic, but containing some important Mesozoic material from classic localities in Europe, no longer available.

The brachiopods are represented by a splendid collection, probably third of importance in this country, well balanced in its representation of American and European material. It occupies about a thousand drawers, and is estimated to contain about two hundred thousand specimens. The gastropods are represented by five hundred drawers of material, and at least a hundred and fifty thousand specimens, a large proportion of which are of European origin. The pelecypods are contained in about sixteen hundred drawers, and represent all geological horizons from which pelecypods are obtained, the preponderance of the collection being European. A beginning on the needed additions to the American portion has recently come to us by the presentation of a large collection from the Cretaceous of Texas by Mr. Dilworth Hager. The cephalopod collection is about the same size as that of pelecypods, and is of especial importance because the greater part of it was studied by Alpheus Hyatt, forming the basis of much of his published work. It contains many types, and many other specimens of historic value. The collection of trilobites is a very good one, stored in five hundred drawers, and representing both Europe and America. The collection contains many types and figured specimens, including a few described by Barrande. A hundred and forty drawers contain the other crustaceans and marine arachnids.

The stratigraphic collection has about nine hundred drawers of Cambrian and Ordovician fossils, a large part of this collection being a by-product of work done under the auspices of the Shaler Memorial fund. The Ordovician of Russia and Scandinavia and of the American Appalachians are particularly well represented. The remainder of the Paleozoic is represented by material in about five hundred drawers, which contain important collections from the Canadian and American Rockies, from Sweden, and from various parts of eastern North America. About two hundred drawers are filled with Mesozoic and Tertiary fossils, chiefly from the United States, but include the collections made by Dr. Robert T. Hill in the West Indies. In comparison to the vastness of the collection, the number of primary types is relatively small; there are perhaps a

thousand of them. No attempt can be made to estimate the number of species obtained from the typical localities or determined by the original describers.

In spite of the size of the collection, over eight thousand drawers, there are obvious gaps. We have almost nothing from Asia, Africa, South America, or the Arctic regions, but we are a little better off in specimens from the West Indies and much better off for Australia. This might be called to the attention of friends who are making expeditions or are in a position to purchase collections.

## LIBRARY

BY

ELEANOR S. PETERS

THE Library of the Museum, located on the second floor, was founded in 1861 by private subscription. From a collection at that time of "more than six thousand volumes," it has grown to its present size, over seventy-six thousand volumes and ninety-five thousand pamphlets. It serves not only the Staff of the Museum, but the students and faculty of the Departments of Zoölogy, Palaeontology, Geology and Geography of the University. It has a large and very complete collection of scientific serials from all parts of the world; some of these are entirely on natural history subjects, but many are the scientific publications of the learned societies and academies of the world, not to be found in any other Harvard library — and in some cases in only one or two other libraries in the country. Over one thousand such serials are received here regularly; of these, over six hundred and fifty are received in exchange for the publications of this Museum, others come as gifts, and many are purchased.

The prestige of the Library has grown through many gifts of the private libraries of such well-known persons as Louis and Alexander Agassiz, Louis de Koninck, Josiah Dwight Whitney, William Brewster, Walter Faxon, Samuel Garman, and William Morton Wheeler. It is largely due to these and other gifts that the Library now possesses many of the very early works on natural history and remarkably complete collections in the fields of ornithology, herpetology, ichthyology, conchology, entomology and geology. On the walls hangs a very remarkable collection of prints or photographs of early and recent scientists, and many original water colors by Brooks, Benson, Fuertes, Sargent, Kaulemans and many others. The Library has some interesting and valuable manuscripts, especially six in Lamarck's holograph and a vast collection of autographs and letters which often prove useful in identifying the handwriting on old labels or museum specimens.

The Faxon bequest brought to the Library his unrivalled collection of Wilsoniana, as also numerous original drawings and paintings by this early American ornithologist. The Museum also possesses many original sketches, etc., by Audubon, as well as much manuscript material by him. The Garman library was rich in Linnaeana as well as rare early works on fishes and reptiles.

The death masks of Agassiz and Audubon are exhibited in the delivery room, as well as the manuscript of Longfellow's well known poem written for a birthday of Louis Agassiz and also holograph letters of Linnaeus, Buffon, Cuvier, Humboldt and other early naturalists.













